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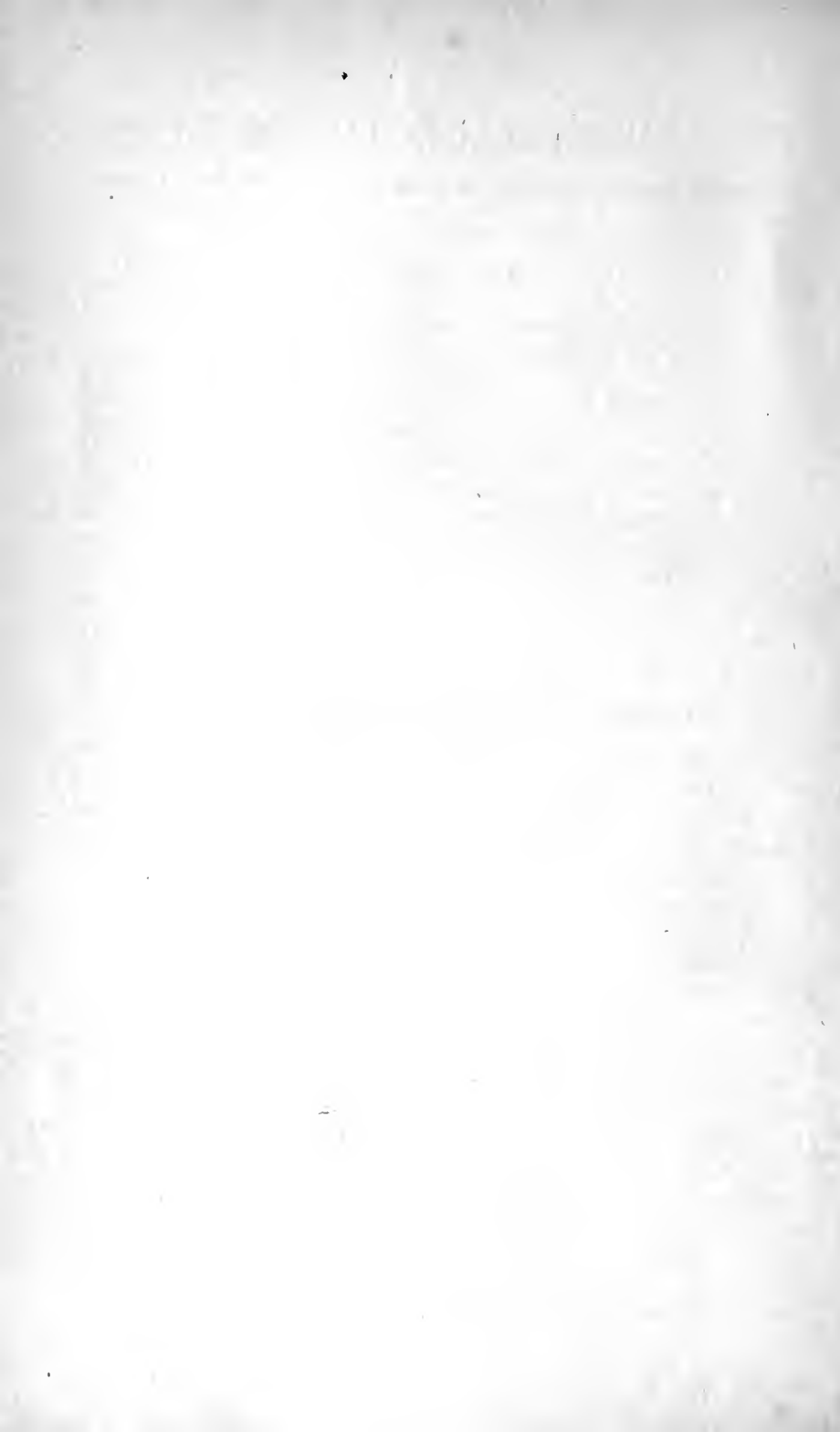
THE JOURNAL OF TUBERCULOSIS.

A QUARTERLY MAGAZINE DEVOTED TO THE PREVENTION
AND TREATMENT OF TUBERCULOSIS.

KARL VON RUCK, B. S., M. D.,
EDITOR.

VOLUME I, 1899.

A. H. McQUILKIN, Publisher,
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The present first number of THE JOURNAL OF TUBERCULOSIS is a beginning toward what is hoped to be the gradual establishment of a representative publication of American endeavor and progress in dealing with the prevention and cure of Tuberculosis. A special organ for this purpose will be more likely to further and increase the growing interest in this subject, and it is the purpose of the editor not only to give his own views and experiences, but to obtain original communications from others, to republish in full or by abstract all important communications on Tuberculosis to current medical literature both in Europe and America, and in the editorial columns to freely discuss their respective merits.

THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.

It is easy enough to recognize this disease, when it is fully established, when the symptoms of fever, cough, expectoration and emaciation have become well marked, and when the expectoration contains the specific germs. Indeed at such a time the patient or the patient's friends strongly suspect the presence of the malady, and the physician can recognize it at a glance.

Such patients have, however, already entered upon the period where the prospect for successful treatment has become doubtful, and in addition they have become a source of danger to others, and especially to such who occupy their rooms and dwellings with them.

It is therefore highly essential, both for the prevention of infection to others and for the successful treatment of the patient, that physicians should make the diagnosis at an earlier stage, which when proper care and interest is taken is not so difficult a problem as would first appear.

Tuberculosis does not as a rule occur primarily in the parenchyma of the lung, but has its beginning in the glandular and lymphatic structures of the respiratory or digestive apparatus, and in many instances these initial deposits cause little or no symptoms at all. The lung affection represents an extension from a glandular or lymphatic focus, which has broken down, and from which the infectious material enters the venous circulation, to be filtered out and deposited in the capillary system of the lungs.

According to the susceptibility, the virulency of the germs, and the extent of the invasion of the lungs, the symptoms accompanying the formation of tubercle in the lungs vary in degree, but the physical symptoms are very slight, or entirely absent in this formative period; and yet it is just at this stage that we should make the diagnosis; for usually it is followed by a period of latency with apparent entire restoration of health which lasts for various lengths of time, until through the advent of an attack of bronchitis, grippe, typhoid fever, or other detrimental conditions, the latent tubercular area begins to break down, and only then do we find tubercle bacilli in the expectoration.

The chief symptom of the formative stage of tubercle is elevation of temperature. Usually this is slight, rarely exceeding more than two degrees, and as a rule less than one degree Fahrenheit. With the rise in temperature there is more or less malaise, a so-called tired feeling, and in most patients the appetite is less keen, and then there is loss of weight. Cough may be entirely absent, if present it is usually so slight that the patient does not speak of it, and refers the slight hacking to his throat.

To make the diagnosis of eruption of tubercle from these symptoms is quite possible, if we exclude all other conditions which give rise to them, and they are not many. Malaria is most frequently diagnosed, but the daily slight rise of temperature when it is carefully observed and recorded, should scarcely justify the diagnosis. In doubtful cases, a trial of quinine, or the examination of the blood may show the error. Endocarditis may be present in which the temperature may be very slight, but as a rule it is continuous, and sooner or later our attention is directed to the heart. Next we may have absorption of some exudate, or of pus, taking place from some point—may be the pelvis—but in these cases the previous history and the local discomfort or pain should point the way.

There is only one course to pursue with patients that come to us with the early symptoms of Tuberculosis, and that is to examine carefully in all directions, and in the absence of any cause which can reasonably account for these symptoms we should suspect the eruption of tubercle somewhere within the organism, and usually in the lungs, especially in patients who by their family history, or by their physical appearance, are predisposed subjects.

Those who are well practiced in physical diagnosis will not have to wait very long, when they will find a diminished respiratory murmur in one or both upper lobes, and with it, especially on coughing, there will appear very fine crepitations; later the inspiration becomes rough or harsh, the expiration is prolonged, and now we also note a relative degree of dullness over the affected area, resulting from the increase of connective tissue which is produced by the reactionary inflammatory changes in the involved parts. When this stage is reached the fever subsides entirely and the patient has for the time no further inconvenience from his tubercular deposit, which has become latent. This constitutes the truly early stage in the chronic form—and proper treatment should be undertaken before destructive changes have been initiated in such latent deposit.

ORIGINAL CONTRIBUTIONS.

REPORT OF 78 CASES OF PULMONARY TUBERCULOSIS TREATED AT THE WINYAH SANITARIUM, ASHEVILLE, N. C., IN 1898, WITH WATERY EXTRACT OF TUBERCLE BACILLI.

By KARL VON RUCK, B. S., M. D.

In making the following report I wish in the first place to disclaim any possible impression that the results recorded are attributed by me entirely to the specific remedy employed, inasmuch as I appear to have been misunderstood by some authors, who in referring to my previous report of 182 cases,* suggested that the favorable climate of Asheville, and other advantages which my patients were afforded, have no doubt also had their equal influence in obtaining my results.

Had my reviewers read my report carefully, they would have found the following sentence immediately below the summary of the results :

“This report is, however, not made with a view of convincing my hearers “of the great value of one particular remedy employed, and I am fully aware “that a variety of favorable influences has contributed to these results.

I am in exactly the same position at this time, having never been willing to do anything but the best that I felt capable of in the management and treatment of my patients and in the treatment of the present series, the climatic treatment, the dietetic, hygienic and hydropathic measures, the institution, management and control of the patients, the use of the pneumatic cabinet, of inhalations and symptomatic medicinal treatment, were all deemed essential and were employed as required, while the specific medication was administered.

If, however, we wish to show the influence of the specific remedy (in the present instance of the Watery Extract of Tubercle Bacilli) we can perhaps do this sufficiently accurate for all practical purposes, by examining the results obtained in this and in other institutions, without the use of specific germ products, and which show apparent recoveries in from 10 to 20 per cent. only ; the difference in the percentage depending no doubt upon the stages in which the cases came under treatment ; and also upon the fact that many patients

*Therapeutic Gazette, May. 1896,

leave off in their efforts to get well, when they are only more or less improved, hoping that no further relapse will thereafter occur.

Many such unfinished cases necessarily enter into reports from institutions, and in all my series, with and without specific treatment, still better results would, no doubt, have been shown, had the improved and greatly improved cases remained long enough under treatment to accomplish the best attainable results.

The evolution of specific medication for infectious diseases has made enough progress, at this time, to justify the serious and thoughtful attention of medical men, and supplies a most interesting and gratifying chapter in the history of medicine of the closing century.

In Tuberculosis this is only less apparent to those who lose sight of the limitations that all remedies must have in their power of removing pathological processes which frequently attain a degree from which recovery or even improvement is absolutely impossible.

The pathological changes of tubercle are no exception to this general truth, as we recognize it for instance, in syphilis, where stages are often reached in which specific medication is absolutely useless.

During the life of the patient it may be difficult and at times impossible to determine the exact pathological changes present, and so it comes, that in practical medicine we often attempt the accomplishment of that, which a full knowledge of the true pathology in the particular case would show us to be useless.

The use of bacterial products as specific remedies for Tuberculosis had its origin with Koch's Tuberculin in 1890, and it, as all the modifications which have since been brought forward, were derived from the fluid upon which the specific germs had been grown.

It was believed that in this fluid certain proteid substances resulting from the Tubercle Bacilli, either as secretions or excretions, or both, were accumulated, and that the peculiar influence of this fluid depended upon these accumulated proteids.

In the meanwhile it was suggested that the Tubercle Bacilli must necessarily contain this principle within their bodies, but all efforts for its extraction proved signal failures.

To test this assumption, injections of dead Tubercle Bacilli were used in animal experiments, but the regular formation of abscess at the point of injection, and the occasional occurrence of spurious tubercles in the body of the experiment animal showed plainly that this method of treatment could not be made use of in the human subject, though the animal experiments gave indication that the germs did contain the curative substances desired.

In the further efforts to obtain this curative substance directly from the Tubercle Bacilli, various methods were resorted to, especially by Professor Koch, who, in April, 1897, announced his Tuberculin R, with which he believed the desired object had been attained.

This product, however, has since been found to be an emulsion of fragments, and of whole Tubercle Bacilli, which, when the remedy is filtered through porcelain, remain upon the filter, and it has been further shown that with this residue, virulent infection can be produced.

The fact that the curative substances could not pass through a porcelain filter was acknowledged by Koch in his paper, and should have been sufficient to establish that a true solution of the germs was not present. The subsequent withdrawal of "Tuberculin R" by the manufacturers was undoubtedly on this account.

In my own efforts to obtain the desired solution, I succeeded, in February, 1896, by the method heretofore published* and which I may again describe for the benefit of those to whom my previous publication is not accessible.

"The Tubercle Bacilli are filtered out of the rapidly growing and highly virulent culture. After washing with distilled water for the removal of the remains of the culture fluid, they are dried in a vacuum dessicator. Next they are powdered in an agate mortar and then extracted with sulphuric ether. This extraction removes the fats. They are again dried and powdered as before and their further extraction takes place in sterilized distilled water over a warm bath with a temperature of 120 deg. F. The proteids becoming dissolved in the distilled water, the fluid is then decanted and filtered through porcelain, when finally the amount of proteids is determined and the preparation standardized to a certain per cent.

Reasoning backward, and recognizing that all the various Tuberculin preparations have shown a certain degree of clinical value, it seems quite probable, that proteids of Tubercle Bacilli entered into all of them during the growth of the culture and also into some of them, (especially Tuberculinum Purificatum) during the process of manufacture.

The amount of proteids was undoubtedly very small and variable, and was associated with the organic substances from the culture fluid.

The Watery Extract as produced by me, and into which absolutely no culture fluid enters, is free from such admixtures and other impurities. It is a perfectly pure solution of the germs only, and being filtered through porcelain, is absolutely free from any germs or fragments thereof.

For its preservation a fraction of a per cent. of Phenol is added, which in no wise alters its clinical value.

*Therapeutic Gazette, June, 1897.

For convenience of administration and to avoid mistakes in making dilutions, we prepare three different strengths of the solution: No. 1 (white label), contains 1-100 of one per cent. of the solid extract, free from water, No. 10 (yellow label), contains 1-10 of one per cent. and No. 100 (red label), contains one per cent. of the extract.

The treatment of cases is begun with No. 1 (white label), and the initial dose is 1-10 of one cubic centimeter or 1-1000 of a milligram of the anhydrous extract. From this dose we increase daily by one-tenth of a cubic centimeter, so that on the second day we give 2-10 c. c., the third day 3-10 c. c., the fourth day 4-10 and the fifth day 5-10 of one c. c. The latter dose equalling 1-500 of a milligram of extract.

I usually repeat 5-10 of a c. c. of No. 1 several times and then I again increase by tenths, until the daily dose is 1 c. c. From now on it is more convenient to use solution No. 10, (yellow label), 1-10 of a cubic centimeter being equal to 1 cubic centimeter of No. 1.

Repeating each dose once or twice we increase by tenths or twentieths of a cubic centimeter until half of a cubic centimeter of No. 10 is given as a daily dose. I find that this dose is quite active, i. e., it shows an unmistakable influence over tubercular processes, therefore the further increase can be more gradual, and as the doses become still larger, the intervals between the injections are first increased to 36 hours and later to 48 hours.

The further increase of 1-10 c. c. every second dose can be made with the same solution or we can now use solution No. 100, (red label), of which 1-10 c. c. is equal to 1 c. c. of No. 10, or to 10 c. c. of No. 1.

It is, of course, a matter of choice with those who wish to use this preparation, to make their own dilutions, either from No. 10 or No. 100, but as the doses are increased the solutions No. 10 and No. 100 are desirable, to obviate the necessity of bulky injections.

Koch, presuming that he had a true solution, stated at the close of his paper, that it was the end of possible improvement of specific remedies for Tuberculosis, and that nothing better could be produced. However this may be, I can confirm his successful animal experiments alike by the use of Tuberculin R, and by the use of my Watery Extract of Tubercle Bacilli, in the actual cure of Guinea pigs as well as in the obtaining of a considerable degrees of immunity; that is to say, animals protected with the Watery Extract of Tubercle Baccill, and with like doses of Koch's Tuberculin R, proved refractory to virulent infection, while the control animals developed the disease and died.

In the same paper in which Professor Koch announced his new Tuber-

culin, he also gave the suggestion of producing a serum of possible value by immunization of animals with this preparation.

This was undertaken in my laboratory immediately, and on the 3rd of May, 1897, the immunization of four goats was commenced. The immunization was continued in two of the animals until October and the remaining two until November. Two animals received Koch's Tuberculin R, from 1 c. c. daily, to 70 c. c. and two received like doses of my Watery Extract of Tubercle Bacilli for the same length of time.

With the serum, taken at different stages of immunization from these animals and at various periods after the supposed immunization was completed, we endeavored to protect Guinea pigs against infection, and to treat them after infection. In the method for protection, we followed that of Fisch, who, in October, 1897, claimed satisfactory results from his serum made by using Tuberculin R. All these animals developed and eventually died of Tuberculosis, and no appreciable result was obtained in immunization or treatment.

My results being so strikingly at variance with those of Dr. Fisch, though carried out with the greatest of care, I repeated the experiments, this time, however, with the serum made by Dr. Fisch himself, and purchased from his laboratory.

On April 5, 1898, the method of protective treatment as published by Dr Fisch was begun with animals Nos. 305, 306, 307, 308, 309, 310 and 311, and continued for one month, when they were all infected by implantation of tissue from a fresh tubercular spleen, In addition, we infected for control, animals Nos. 312, 313, 314 and 315.

The injections of Fisch's serum were continued in Nos. 309, 310 and 311, all with the following results.

Animal No. 305, protected with Fisch's serum: original weight, 765 grams, at death 512 grams, died August 22. Postmortem showed point of infection a caseous mass, with perforated skin; glands enlarged, mostly caseous; spleen and liver enlarged, full of small tubercles; few tubercles in lungs; extensive pneumonic consolidation. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 306, protected with Fisch's serum: original weight, 500 grams, at death 412 grams, killed September 16. Postmortem: point of infection a caseous mass, skin perforated. Lungs show few tubercles, many in spleen and liver; glands caseous. Microscopical: many tubercle bacilli in all tissue examined.

Animal No. 307, protected with Fisch's serum: original weight 490 grams, at death 405 grams, killed September 16. Postmortem: point of infection caseous mass, ulcerated: glands enlarged, many caseous and soft; liver,

spleen and lungs full of tubercles, some of them caseous. Microscopical: many tubercle bacilli in all the tissues examined.

Animal No. 308, protected with Fisch's serum: original weight 500 grams, at death 440 grams, killed September 16. Postmortem: point of infection caseous; glands enlarged, some caseous and soft, others fibroid; liver and spleen enlarged, contain caseous and fibroid tubercles; ad-renals, tubercular. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 309, protected with Fisch's serum and subsequently treated with the same in doses of 0.3 to 0.5 c. c. every other day until death: original weight 516 grams, at death 410 grams, killed September 16. Postmortem: point of infection caseous mass, and open ulcer; few tubercles in peritoneum; liver and spleen greatly enlarged and full of tubercles, many tubercles in lungs. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 310, protected and treated same as No. 309, original weight 470 grams, at death 440 grams, killed September 16. Postmortem: point of infection fibroid tubercle; glands enlarged, few caseous, most of them fibroid; liver and spleen greatly enlarged, full of miliary tubercles; lungs tubercular. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 311, protected and treated same as Nos. 309 and 310; original weight 500 grams, at death 430 grams, killed September 16. Postmortem: point of infection, caseous ulcer; glands enlarged, fibroid and caseous; liver and spleen enlarged, full of tubercles; lungs slightly tubercular, several caseous masses. Microscopical: many tubercle bacilli in all tissue examined.

Animal No. 312, control: infected, but not protected or treated: original weight 520 grams, at death 460 grams, killed September 15. Postmortem: point of infection caseous; few tubercles in peritoneal adhesions; glands enlarged, many of them caseous; liver and spleen enlarged, contain many miliary tubercles, few isolated tubercles in lungs. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 313, control: original weight 620 grams, at death 580 grams, killed September 15. Postmortem: point of infection caseous, surrounded by recent tubercles; most glands fibroid; liver and spleen greatly enlarged, full of miliary and a few caseous tubercles, numerous tubercles in lungs; ad-renals enlarged, tubercular. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 314, control: original weight 570 grams, at death 550 grams, killed September 15. Postmortem: point of infection hard indurated mass; glands enlarged, most of them fibroid, few caseous; liver and spleen enlarged, full of tubercles; lungs, few fibroid nodules. Microscopical: tubercle bacilli in all tissues examined.

Animal No. 315, control: original weight, 510 grams, at death 460 grams, killed September 15. Postmortem: point of infection caseous mass; glands enlarged, some hard, some caseous and soft; liver, few small tubercles; spleen enlarged, contains many miliary tubercles; lungs, few fibroid tubercles; ad-renals enlarged, caseous. Microscopical: tubercle bacilli found in all tissues examined.

Animal No. 316, control: original weight 470 grams, at death 420 grams, killed September 15. Postmortem: point of infection, caseous; glands enlarged and hard, liver greatly enlarged, contains large caseous tubercle; spleen enlarged, many small tubercles; lungs, few caseous tubercles. Microscopical: tubercle bacilli in all tissues examined.

These results are entirely in conformity with those from the use of my goat serum, and I presume that Dr. Fisch killed his animals entirely too soon, namely, a month after infection, a period ordinarily insufficient for the development and recognition of tubercles.

I have previously published* some of my experimental work with Watery Extract of Tubercle Bacilli, and with other products derived from the culture fluid upon which Tubercle Bacilli had been grown.

More recently I have made another series of experiments with Watery Extracts of Tubercle Bacilli, and with Koch's Tuberculin R, and which, though not entirely completed, appear to confirm my previous statement that these preparations are curative as well as protective.

Clinically, I have had the aid of several colleagues in endeavoring to find the best method of dosage, selection of cases, etc., and I am especially indebted to Dr. Charles Denison, of Denver, and also to Dr. J. Longstreet Taylor, of St. Paul, and Dr. John H. Williams, of Asheville, for valuable assistance, they also having all obtained valuable results from my preparation.†

In the study of the effect of the remedy I have found that it is also capable of producing reaction, in the local tubercular area, which can be readily observed with the eye in tubercular infiltration in the larynx.

In the lungs also, we note evidence of congestion in tubercular localities, and particularly in the outlying areas where more recent tubercles are present. Singularly and contrary to the experience with crude Tuberculin and its mod-

*Cincinnati Lancet Clinic, February 8, 1898.

†Dr. Williams kindly put at my disposal the clinical data of 12 cases treated by him with my Watery Extract and discharged during the past year. They comprise seven early stage cases, all of which were discharged as cured; three more advanced stage cases, one of which was discharged cured, and two cases greatly improved; two cases in the third stage, of which one was cured, and one case (treated only three weeks) grew worse.

ifications, these local reactions are not usually accompanied with fever, on the contrary the temperature is frequently lower than before.

I have elsewhere* recorded my experience, which I believe justifies me in saying that any proteid injected subcutaneously in sensible quantities is liable to produce fever. Blood serum, solutions of egg-albumen, beef extract, beef peptone and nuclein, all produce a rise of temperature after their hypodermic injection, and to all of these toleration can be established by beginning with small quantities which, when thereafter gradually increased even to very large doses do not disturb the temperature.

These substances have, however, no visible or apparent effect upon tubercular tissues, whether fever follows their injection or not. That is to say, we do not note the selective influence by which only tubercular tissues become injected and turgescient. On the contrary, all we observe is the fever, with its general disturbance of the well-being of the patient.

For the production of fever with the various organic substances mentioned, much larger quantities than the amount contained in the maximum dose of the Watery Extract, are necessary, and the non-occurrence of fever reactions from Watery Extract to doses of from 1-1000 to 3 or 4 milligrams of organic substance may, perhaps, be thus explained.

In all my cases I have so gradually increased my doses, that I have seen no unduly prolonged local effect, and I believe that such gradual increase is for the present the best and safest method of procedure. When a distinct local effect is produced, as evidenced by the temporary local congestion of the tubercular locality, I allow this to subside before I give another dose, which is usually the case in 24 to 36 hours. When the effect is unduly prolonged, I reduce the next dose, and when no effect is produced I increase the dose.

Many physicians will of course be unable to observe and watch these local effects for a variety of reasons, and in such instances a very gradual and conservative increase is the best and safest course to pursue. A number of colleagues to whom I have supplied the remedy within the last 18 months have been so circumstanced that no control as to reaction was possible, and they have obtained excellent results, nevertheless, though the treatment was somewhat prolonged.

From the reports that have reached me from such colleagues and from my own observation, I believe I am entirely safe in saying, that if the increase is slow enough so that not more than 0.3 c. c. of No. 10 Solution is reached the first month, and the gradual additions to this dose do not exceed 0.5 c. c. in subsequent months, no fear of undue reactions need be entertained, and the result will prove entirely satisfactory.

*New Orleans Medical Journal, July, 1898.

How satisfactory this may be, and how much visible improvement may be noted, will depend upon the pathological changes present, and also upon the additional care and treatment the patient receives. The latter will be more a factor the more advanced the case may be in destructive process, supuration and softening in caseous localities, and in complications. In such cases the cough, fever and heart action, diet and general conduct of the patient need careful attention and supervision.

I shall be glad at all times to supply as far as I have them, reprints of articles on these and other subjects, in which I have recorded my experiences.

It is chiefly in early and middle stage cases, free from absorption fever, with a fair degree of nutrition, and free from serious complications, that I have obtained my best results, and I would urge those who desire to use the remedy under consideration, to select only such cases, at least for a beginning.

In the observation of the involved lung portions and other tubercular localities, while the treatment is administered, I have rarely failed to note unmistakable changes for the better within the first month or six weeks, particularly in recent extensions to adjacent lung portions, and to the opposite lung, and in recent infiltrations of the larynx.

Removable tubercles in the lung do not, however, as a rule reveal their presence by a dull percussion note unless the alveoli and bronchioles are entirely obstructed by their presence ; nor do such tubercular deposits ordinarily cause bronchial respiration much less coarse rales and ronchi. On the contrary the changes induced by purely tubercular deposits, especially when of recent origin, are delicate, and cause scarcely perceptible or but slight changes on percussion, while auscultation shows a weak, feeble respiratory murmur, which may be more or less rough on inspiration, when we also may note very fine crepitation. Later, after some months, the reactionary inflammatory changes in tissues, where tubercle has been formed, cause increase of connective tissue, and now the percussion changes become more marked while the respiration may become harsh and bronchial.

Many practitioners, who are not in constant practice, may have difficulty in making out these delicate changes, and if they fail to recognize them when the patient comes under treatment, they will, of course, not note their disappearance later on. However, this may be, they should not expect that the physical symptoms due to fibroid changes, caseous pneumonia, thickened pleura and such like, will clear up and disappear under the use of this remedy, and if they cannot recognize the less pronounced changes, they must be content to note the more general improvement, which always follows, unless in badly selected cases in which the irremediable conditions control the clinical course entirely.

Most cases coming under my care, even in advanced stages, present more or less recent extension of the tubercular disease in the lungs, which are destined to follow alike, but as a rule, a more rapid and less favorable course than the earlier deposits have done.

It is not a matter of indifference whether these new deposits shall be allowed to remain and to undergo degenerative changes, or whether they shall be removed. If such cases are not already doomed on account of other irremovable conditions, the clearing up of such deposits removes a serious and often insuperable hindrance to their improvement, and to the arrest of the disease. This, the Watery Extract of Tubercle Bacilli will do, even in advanced stages, when the patient's nutrition is still fair.

Coming now to the result of the 78 cases treated and discharged, I may emphasize again, that the treatment was administered under ideal conditions in every respect, and wish to again record my faith in the helpful influence of climate, and the advantages which a well conducted institution affords. The number of Tubercle Bacilli given refers to an average count of one square millimeter upon the cover glass. Reg. stands for "regular forms," i. e., perfectly well developed bacilli; deg. stands for "degenerated forms" (granular, club-shaped, and fragments). V. C. indicates "vital capacity" in cubic inches, measured on the Spirometer.

CLASS A.

Twenty Cases Pulmonary Tuberculosis in Early Stage, Prognosis Good. Treated with "Watery Extract of Tubercle Bacilli (von Ruck)."

CASE No. 2700.

ADMISSION: Temp. 99.4; Pulse 92; cough moderate; Expect.: 1 oz. mucopur.; Tub. Bac. 16, regular form; V. C. 205; Lung disease: both upper lobes, Tub. glands in neck; Weight 165.

RESULT: Treated 3½ mos.; Temp. 98.2; Pulse 78; no cough; no expectoration; In lungs: only fibroid changes, glands disappeared; V. C. 280; Weight 186; gained 21 lbs.; Disease arrested. Recovered.

CASE No. 2726.

ADMISSION: Temp. 102; Pulse 100; cough slight; Expect.: 1.5 oz. mucous; Tub. Bac. 2; few Str. cocci; Lung dis-

ease: right upper lobe, pleurisy; V. C. 100; Weight 120.

RESULT: Treated 2½ mos.; Temp. 98.2; Pulse 80; no cough; no expectoration; Lungs: clear, pleuritic effusion disappeared; V. C. 160; Weight 124; gained 4 lbs. Recovered.

CASE No. 2727.

ADMISSION: Temp. 99.4; Pulse 88; cough slight; Expect.: 2 oz. mucopur.; Tub. Bac. 12, regular form; few Str. cocci; many Staph. cocci; Lung disease: left upper lobe, right apex; V. C. 180; Weight 145.

RESULT: Treated 3 mos.; Temp. 98.2; Pulse 80; no cough; no expectora-

tion; Lungs: slight retraction of left apex, rest normal; V. C. 240; Weight 154; gained 9 lbs. Recovered.

CASE No. 2738.

ADMISSION: Temp. 100.2; Pulse 90; cough slight; Expect.: $\frac{1}{2}$ oz. mucous; Tub. Bac. 0; few Diplo-cocci; Lung disease: both apices; V. C. 110; Weight 108.

RESULT: Treated 3 mos.; Temp. 98.5; Pulse 76; no cough; no expectoration; Lungs: clear; V. C. 140; Weight 130; gained 22 lbs.; Recovered.

CASE No. 2757.

ADMISSION: Temp. 99.5; Pulse 92; cough slight; Expect.: $\frac{1}{4}$ oz. mucous; no Tub. Bac.; Lung disease: right upper lobe, recent extension to left side; V. C. 100; Weight 110.

RESULT: Treated 3 mos.; Temp. 98.2; Pulse 78; no cough; no expectoration; Lungs: fibroid changes in right upper lobe, left lung clear; V. C. 120; Weight 126; gained 16 lbs. Disease arrested. Recovered.

CASE No. 2792.

ADMISSION: Temp. 99.4; Pulse 90; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 7, regular form; many Staph. cocci; Lung disease: both upper lobes; V. C. 210; Weight 150.

RESULT: Treated $4\frac{1}{2}$ mos.; Temp. 98.3; Pulse 80; no cough; no expectoration; Lungs: clear; V. C. 250; Weight 161; gained 11 lbs. Recovered.

CASE No. 2799.

ADMISSION: Temp. 99; Pulse 78; cough slight; Expect.: 1.5 oz. mucopur.; Tub. Bac. 4, regular form; many Staph. cocci; Lung disease: small cavity in right upper lobe; slight extension to left side; V. C. 150; Weight 137.

RESULT: Treated 4 mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: slight fibroid changes in right side, cavity not found, left lung clear; V. C. 260; Weight 146; gained 9 lbs. Disease arrested. Recovered.

CASE No. 2813.

ADMISSION: Temp. 100.2; Pulse 108; cough moderate; Expect.: 1.5 oz. mucopur.; Tub. Bac. 12, regular and deg. forms; Lung disease: right apex and left upper lobe; V. C. 190; Weight 137.

RESULT: Treated $2\frac{1}{2}$ mos.; Temp. 98.2; Pulse 70; no cough; no expectoration; Lungs: slight fibroid changes in left upper lobe; V. C. 260; Weight 159; gained 22 lbs. Disease arrested. Recovered.

CASE No. 2814.

ADMISSION: Temp. 99.6; Pulse 84; cough moderate; Expect.: 2 oz. mucous; Tub. Bac. 5, regular form; Lung disease: right upper lobe, slight extension to left side; V. C. 210; Weight 146.

RESULT: Treated $2\frac{1}{2}$ mos.; Temp. 98.4; Pulse 70; no cough; no expectoration; Lungs: clear; V. C. 225; Weight 156; gained 10 lbs. Recovered.

CASE No. 2816.

ADMISSION: Temp. 100.8; Pulse 96; cough slight; Expect.: 2 oz. mucous; Tub. Bac. 144, regular form; few Staph. cocci; Lung disease: both apices. Tub. cervical glands; V. C. 110; Weight 101.

RESULT: Treated 3 mos.; Temp. 98.4; Pulse 84; no cough; no expectoration; Lungs: clear, glands disappeared; V. C. 125; Weight 109; gained 8 lbs. Recovered.

CASE No. 2826.

ADMISSION: Temp. 100; Pulse 90; cough slight; Expect.: 0.5 oz. mucous; no Tub. Bac.; Lung disease: both apices; V. C. 140; Weight 112.

RESULT: Treated $2\frac{1}{2}$ mos.; Temp. 98; Pulse 80; no cough; no expectoration; Lungs: clear; V. C. 150; Weight 118; gained 6 lbs. Recovered.

CASE No. 2830.

ADMISSION: Temp. 98.8; Pulse 84; cough slight; Expect.: $\frac{1}{2}$ oz. mucous; Tub. Bac. 25, regular form; few Staph. cocci; Lung disease: right upper lobe, slight extension to left side; V. C. 150; Weight 150.

RESULT: Treated 2 mos.; Temp. 98.2; Pulse 80; no cough; no expectoration; Lungs: slight fibroid changes at right apex, other parts clear; V. C. 190; Weight 160; gained 10 lbs. Disease arrested. Recovered.

CASE No. 2837.

ADMISSION: Temp. 99.2; Pulse 84; cough slight; Expect.: none; Lung disease: both apices; V. C. 130; Weight 113.

RESULT: Treated 3 mos.; Temp. 98.4; Pulse 78; no cough; no expectoration; Lungs: clear; V. C. 140; Weight 120; gained 7 lbs. Recovered.

CASE No. 2839.

ADMISSION: Temp. 99.4; Pulse 100; cough moderate; Expect.: none; Lung disease: right upper lobe. Tub. cervical glands; V. C. 155; Weight 108.

RESULT: Treated 3 mos.; Temp.

98; Pulse 84; no cough; no expectoration; Lungs: clear, glands disappeared; V. C. 160; Weight 114; gained 6 lbs. Recovered.

CASE No. 2842.

ADMISSION: Temp. 99.8; Pulse 84; cough slight; Expect. : 1 oz. mucous; Tub. Bac. 32, regular and deg. forms; few Staph. cocci; Lung disease: both upper lobes; V. C. 195; Weight 145.

RESULT: Treated 2 mos. ; Temp. 98.4; Pulse 80; no cough; no expectoration; Lungs: clear; V. C. 250; Weight 147; gained 2 lbs. Recovered.

CASE No. 2858.

ADMISSION: Temp. 100; Pulse 90; cough slight; Expect. : none; Lung disease: left apex; V. C. 160; Weight 130.

RESULT: Treated 2½ mos. ; Temp. 98.6; Pulse 70; no cough; no expectoration; Lungs: clear; V. C. 200; Weight 139; gained 9 lbs. Recovered.

CASE No. 2859.

ADMISSION: Temp. 100; Pulse 90; cough slight; Expect. : none; Lung disease: right apex; V. C. 210; Weight 135.

RESULT: Treated 3½ mos. ; Temp. 98.6; Pulse 88; no cough; no expectoration; Lungs: clear; V. C. 260; Weight 145; gained 10 lbs. Recovered.

CASE No. 2860.

ADMISSION: Temp. 99.4; Pulse 96;

cough slight; Expect. : 1.5 oz. mucous; Tub. Bac. 0; many Staph. cocci; Lung disease: both upper lobes; V. C. 140; Weight 120.

RESULT: Treated 3½ mos. ; Temp. 98.2; Pulse 84; no cough; no expectoration; Lungs: clear; V. C. 180; Weight 136; gained 16 lbs. Recovered.

CASE No. 2869.

ADMISSION: Temp. 100; Pulse 90; cough slight; Expect. : 1 oz. muco-pur. ; Tub. Bac. 14, regular form; many Staph., few Diplo-cocci; Lung disease; right apex. Tub. axillary glands; V. C. 150; Weight 131.

RESULT: Treated 4 mos. ; Temp. 98.4; Pulse 78; no cough; no expectoration; Lungs: clear, glands diminished in size; V. C. 160; Weight 142; gained 11 lbs. Recovered.

CASE No. 2888.

ADMISSION: Temp. 101.2; Pulse 34; cough moderate; Expect. : 2.5 oz. mucopur. ; Tub. Bac. 270, regular form; few Staph. cocci; Lung disease: both upper lobes; V. C. 130; Weight 112.

RESULT: Treated 3 mos. ; Temp. 98.8; Pulse 72; no cough; no expectoration; Lung: fibroid changes in right lung, left lung clear; V. C. 130; Weight 119; gained 7 lbs. Disease arrested. Recovered.

CLASS B.

Thirty-seven Cases of Pulmonary Tuberculosis in More Advanced Stages, Prognosis Fair. Treated with Watery Extract of Tubercle Bacilli (von Ruck).

CASE No. 2702.

ADMISSION: Temp. 101.2; Pulse 108; cough severe; Expect. : 4.5 oz. mucopur. ; Tub. Bac. 290, regular form; many Staph. cocci; night sweats; Lung disease: both upper lobes and portion of right lower, cavity in right apex; V. C. 120; Weight 108.

RESULT: Treated 5 mos. ; Temp. 99; Pulse 84; cough slight; Expect. : ½ oz. mucous; no Tub. Bac. ; few Staph. cocci; no night sweats; Lungs: left lung clear, right lower lobe clear, right

apex fibroid changes, cavity dry; V. C. 160; Weight 122; gained 14 lbs. Disease arrested. Recovered.

CASE No. 2716.

ADMISSION: Temp. 100.3; Pulse 96; cough moderate; Expect. : 3 oz. mucopur. ; Tub. Bac. 40, regular form; many Staph., few Diplo-cocci; night sweats; Lung disease: both upper lobes, cavity in left side; V. C. 170; Weight 142.

RESULT: Treated 4 mos. ; Temp. 98.4; Pulse 80; cough slight; Expect. : ½ oz. mucous; no Tub. Bac. ; no night

sweats; Lungs: fibroid changes in both apices, cavity dry; V. C. 200; Weight 156; gained 14 lbs. Disease arrested. Recovered.

CASE No. 2720.

ADMISSION: Temp. 100.5; Pulse 90; cough moderate; Expect.: 2.5 oz. muco-pur.; Tub. Bac. 320, regular form; many Strepto and Staph. cocci; Lung disease: both upper lobes; cavity in right side, right knee-joint, tubercular; V. C. 160; Weight 134.

RESULT: Treated 3 mos.; Temp. 98.3; Pulse 80; cough slight; Expect.: 1 oz. muco-pur.; Tub. Bac. 80, deg. form; few Strepto-cocci; Lungs: fibroid changes in both apices, cavity dry; knee joint improved; V. C. 195; Weight 148; gained 14 lbs. Greatly improved.

CASE No. 2742.

ADMISSION: Temp. 99; Pulse 84; cough moderate; Expect.: 2 oz. muco-pur.; Tub. Bac. 96, regular and deg. forms; Lung disease: both upper lobes, cavity in right apex; V. C. 130; Weight 147.

RESULT: Treated 5 mos.; Temp. 98.2; Pulse 78; no cough; no expectoration; Lungs: fibroid changes in both apices, cavity dry; V. C. 155; Weight 151; gained 4 lbs. Disease arrested. Recovered.

CASE No. 2762.

ADMISSION: Temp. 99; Pulse 96; cough moderate; Expect.: 1 oz. muco-pur.; Tub. Bac. 4, regular form; Lung disease: both upper lobes, cavity in right apex; V. C. 80; Weight 93.

RESULT: Treated 3 mos.; Temp. 98.2; Pulse 80; no cough; no expectoration; Lungs: fibroid changes in both apices, cavity dry; V. C. 135; Weight 108; gained 15 lbs. Disease arrested. Recovered.

CASE No. 2764.

ADMISSION: Temp. 100.4; Pulse 80; cough severe; Expect.: 6.5 oz. purulent; Tub. Bac. 172, regular form; Strepto and Staph. cocci; night sweats; Lung disease: both upper and right middle lobes, abscess of mediastinal glands; V. C. 130; Weight 120.

RESULT: Treated 6½ mos.; Temp. 98.4; Pulse 72; cough moderate; Expect.: 1.5 oz. muco-pur.; Tub. Bac. 72, deg. form; Staph. cocci; no night sweats; Lungs: clear, abscess improved; V. C. 155; Weight 135; gained 15 lbs. Greatly improved.

CASE No. 2772.

ADMISSION: Temp. 99.2; Pulse 84; cough moderate; Expect.: 2.5 oz. muco-pur.; Tub. Bac. 30, regular and deg. forms; Staph. cocci; Lung disease: both upper and right middle lobes; cavity in right apex; larynx: tub. infiltration; V. C. 200; Weight 143.

RESULT: Treated 4 mos.; Temp. 98.8; Pulse 84; no cough; no expectoration; Lungs: fibroid changes in left upper lobe; right lung clear; larynx: healed; V. C. 240; Weight 160; gained 17 lbs. Disease arrested. Recovered.

CASE No. 2773.

ADMISSION: Temp. 99.8; Pulse 84; cough moderate; Expect.: 2 oz. muco-pur.; Tub. Bac. 156, regular form; Staph. cocci; Lung disease: right upper and middle lobes, cavity in left apex; V. C. 180; Weight 140.

RESULT: Treated 4½ mos.; Temp. 98.4; Pulse 72; no cough; no expectoration; Lungs: fibroid changes in left upper lobe, cavity smaller and dry, right lung clear; V. C. 225; Weight 160; gained 20 lbs. Disease arrested. Recovered.

CASE No. 2774

ADMISSION: Temp. 99.4; Pulse 96; cough moderate; Expect.: 1 oz. muco-pur.; Tub. Bac. 114, regular form; Strepto, Staph. and Diplo-cocci; Lung disease: both upper lobes, cavity in left apex; larynx: tub. infiltration; V. C. 160; Weight 128.

Result: Treated 1½ mos.; Temp. 99.4; Pulse 84; cough moderate; Expect.: ½ oz. muco-pur.; Tub. Bac. 100, regular form; few Strepto-cocci; Lungs: right upper lobe improved; larynx: improved; V. C. 160; Weight 130; gained 2 lbs. Improved.

CASE No. 2780.

ADMISSION: Temp. 99.4; Pulse 96; cough slight; Expect.: ½ oz. muco-pur.; Tub. Bac. 4, regular form; Lung disease: both upper lobes, softening on right side; V. C. 90; Weight 116.

RESULT: Treated 5 mos.; Temp. 98.2; Pulse 80; no cough, no expectoration; Lungs: left lung clear, dry cavity in right apex; V. C. 100; Weight 120; gained 4 lbs. Disease arrested. Recovered.

CASE No. 2783.

ADMISSION: Temp. 102; Pulse 108; cough slight; Expect.: 1 oz. muco-pur.; Tub. Bac. 39, regular form; Lung disease: entire left lung with pleuritic exudate; V. C. 100; Weight 131.

RESULT: Treated 4 mos.; Temp. 98.4; Pulse 72; no cough; no expectoration; Lungs: upper lobe nearly clear; exudate absorbed; V. C. 175; Weight 152; gained 21 lbs. Disease arrested. Recovered.

CASE No. 2784.

ADMISSION: Temp. 103; Pulse 120; cough severe; Expect.: 3 oz. mucopur.; Tub. Bac. 100, regular form; Staph. cocci; night sweats; Lung disease; both upper lobes; tubercular cervical glands; V. C. 95; Weight 105.

RESULT: Treated 6 mos.; Temp. 98.2; Pulse 80; no cough; no expectoration; no night sweats; Lungs: fibroid changes in right apex, rest clear; glands: most of them disappeared; V. C. 145; Weight 127; gained 22 lbs. Disease arrested. Recovered.

CASE No. 2788.

ADMISSION: Temp. 99.6; Pulse 90; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 522, regular form; Lung disease: both upper lobes, large cavity in right side; V. C. 120; Weight 121.

RESULT: Treated 6 mos.; Temp. 98.6; Pulse 84; no cough; no expectoration; Lungs: left lung clear, right upper lobe fibroid changes, cavity dry and greatly diminished in size; V. C. 140; Weight 133; gained 12 lbs. Disease arrested. Recovered.

CASE No. 2791.

ADMISSION: Temp. 99.8; Pulse 80; cough slight; Expect.: $\frac{1}{2}$ oz. mucous; Tub. Bac. 0; Lung disease: both upper lobes, softening of left side; V. C. 80; Weight 94.

RESULT: Treated 4 mos.; Temp. 98; Pulse 84; no cough; no expectoration; Lungs: fibroid changes in apices small cavity in left apex, dry; V. C. 130; Weight 96; gained 2 lbs. Disease arrested. Recovered.

CASE No. 2804.

ADMISSION: Temp. 101; Pulse 90; cough moderate; Expect.: 4 oz. mucopur.; Tub. Bac. 62, regular form; Staph. cocci; Lung disease: in right apex, suppur. cavity, general dissemination in both lungs; V. C. 180; Weight 144.

RESULT: Treated 4 mos.; Temp. 98.4; Pulse 78; cough slight; Expect.: $\frac{1}{2}$ oz. mucous; no Tub. Bac.; Lungs: cavity much smaller, nearly dry; left lung clear; V. C. 165; lost weight rapidly first 6 weeks down to 126, gained since 10 lbs. Greatly improved.

CASE No. 2805.

ADMISSION: Temp. 99.2; Pulse 84; cough slight; Expect.: 2 oz. mucopur.; Tub. Bac. 27, regular form; Lung disease: both upper lobes, small cavity in right apex; V. C. 140; Weight 116; losing rapidly for last two months.

RESULT: Treated 3 mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: left lung clear, retraction of right apex, cavity not found; V. C. 240; Weight 160; gained 44 lbs. Disease arrested. Recovered.

CASE No. 2812.

ADMISSION: Temp. 99.4; Pulse 96; cough slight; Expect.: 1 oz. mucous; Tub. Bac. 16, regular form; Lung disease: entire left lung, right apex; V. C. 105; Weight 88.

RESULT: Treated 2 mos.; Temp. 99; Pulse 84; no cough; no expectoration; Lungs: fibroid changes in right apex, left lung improved; V. C. 110; Weight 91; gained 3 lbs. Improved.

CASE No. 2820.

ADMISSION: Temp. 100.8; Pulse 108; cough moderate; Expect.: 1 oz. mucopur.; Tub. Bac. 90, regular form; Lung disease: both upper lobes and right middle; cervical glands tubercular; V. C. 120; Weight 81.

RESULT: Treated $2\frac{1}{2}$ mos.; Temp. 98.3; Pulse 70; no cough; no expectoration; Lungs: right middle lobe clear, left upper nearly clear, fibroid changes in right upper lobe; glands: no change; V. C. 130; Weight 87; gained 6 lbs. Greatly improved.

CASE No. 2821.

ADMISSION: Temp. 99.4; Pulse 92; cough slight; Expect.: 2 oz. mucous; Tub. Bac. 0; night sweats; Lung disease: left upper lobe, recent extension to right upper and left lower lobes; V. C. 140; Weight 116.

RESULT: Treated 6 mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; no night sweats; Lungs: fibroid changes in left upper lobe, rest clear; V. C. 240; Weight 130; gained 14 lbs. Disease arrested. Recovered.

CASE No. 2822.

ADMISSION: Temp. 99.4; Pulse 88; cough moderate; Expect.: 1.5 oz. mucous; Tub. Bac. 1, regular form; Lung disease: both upper lobes, dry cavity in right side; V. C. 170; Weight 126.

RESULT: Treated $3\frac{1}{2}$ mos.; Temp. 98.4; Pulse 72; no cough; no expectoration; Lungs: left lung clear, right up-

per no change; V. C. 190; Weight 136; gained 10 lbs. Disease arrested. Recovered.

CASE No. 2824.

ADMISSION: Temp. 100.2; Pulse 92; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 10, regular form; Staph. cocci; Lung disease: both upper lobes, cavity in left apex; V. C. 100; Weight 95.

RESULT: Treated 2½ mos.; Temp. 98.2; Pulse 84; no cough; no expectoration; Lungs: right lung clear, left upper lobe improved; V. C. 100; Weight 99; gained 4 lbs. Greatly improved.

CASE No. 2825.

ADMISSION: Temp. 99.6; Pulse 84; cough moderate; Expect.: 3 oz. mucopur.; Tub. Bac. 8, regular form; Lung disease: both upper lobes, cavity in right apex; V. C. 160; Weight 125.

RESULT: Treated 3 mos.; Temp. 98.3; Pulse 72; no cough; no expectoration; Lungs: left lung fibroid retraction of apex, right apex fibroid, cavity diminished in size and dry; V. C. 225; Weight 145; gained 20 lbs. Disease arrested. Recovered.

CASE No. 2831.

ADMISSION: Temp. 99; Pulse 80; cough slight; Expect.: ½ oz. mucopur.; Tub. Bac. 10, regular form; Staph. cocci; Lung disease: both upper lobes; V. C. 130; Weight 116.

RESULT: Treated 5½ mos.; Temp. 98.2; Pulse 80; no cough; no expectoration; Lungs: left lung clear, right apex fibroid; V. C. 150; Weight 119; gained 3 lbs. Disease arrested. Recovered.

CASE No. 2833.

ADMISSION: Temp. 99.6; Pulse 90; cough moderate; Expect.: ½ oz. mucopur.; Tub. Bac. 56, regular form; Staph. cocci; Lung disease: both upper lobes, softening of left side; V. C. 125; Weight 119.

RESULT: Treated 3 mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: fibroid changes in left upper lobe, right lung clear; V. C. 190; Weight 127; gained 8 lbs. Disease arrested. Recovered.

CASE No. 2834.

ADMISSION: Temp. 101.5; Pulse 100; cough severe; Expect.: 2.5 oz. mucopur.; Tub. Bac. 234, regular form; Staph., Strepto and Diplo-cocci; Lung disease: both upper lobes, softening of left side; V. C. 120; Weight 125; Gastric catarrh.

RESULT: Treated 1½ mos.; Temp. 100.3; Pulse 90; cough moderate; Expect.: 1.5 oz. mucopur.; Tub. Bac. 60, deg. form; few Str. and Staph. cocci; Lungs: less rales on left side, no other change; V. C. 120; lost weight first two weeks to 119, gained 6 lbs. after gastric catarrh was improved. Improved.

CASE No. 2846.

ADMISSION: Temp. 99.2; Pulse 80; cough moderate; Expect.: 1.5 oz. mucopur.; Tub. Bac. 90, regular form; Staph. and Diplo-cocci; Lung disease: both upper lobes, small cavity in right apex; V. C. 180; Weight 132.

RESULT: Treated 4 mos.; Temp. 98.4; Pulse 72; no cough; no expectoration; Lungs: left lung clear, slight retraction of right apex, cavity not found; V. C. 200; Weight 145; gained 13 lbs. Disease arrested. Recovered.

CASE No. 2848.

ADMISSION: Temp. 101.2; Pulse 88; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 112, regular form; Staph. cocci; Lung disease: both upper lobes and part of left lower; V. C. 200; Weight 145.

RESULT: Treated 4 mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: left lung clear, right nearly so; V. C. 200; Weight 157; gained 12 lbs. Disease arrested. Recovered.

CASE No. 2849.

ADMISSION: Temp. 102; Pulse 96; cough moderate; Expect.: 1.5 oz. mucopur.; Tub. Bac. 90, regular form; Staph. cocci; Lung disease: both upper lobes, softening of left side; tubercular perirectal abscess; V. C. 230; Weight 142.

RESULT: Treated 4 mos.; Temp. 98.2; Pulse 70; no cough; no expectoration; Lungs: right lung clear, left nearly clear; abscess: healed; V. C. 250; Weight 160; gained 18 lbs. Disease arrested. Recovered.

CASE No. 2851.

ADMISSION: Temp. 99.6; Pulse 88; cough moderate; Expect.: 1 oz. mucous; Tub. Bac. 4, regular form; Lung disease: both upper lobes, recent extension left lower; larynx: tubercular infiltration; V. C. 120; Weight 114.

RESULT: Treated 3 mos.; Temp. 99; Pulse 84; cough slight; Expect.: .5 oz. mucous; no Tub. Bac.; some Staph. cocci; Lungs: right apex fibroid, left lung clear; larynx: greatly improved; V. C. 120; Weight 119; gained 5 lbs.; Lung disease arrested. Recovered.

CASE No. 2853.

ADMISSION: Temp. 100.4; Pulse 112; cough severe; Expect.: 2 oz. mucopur.; Tub. Bac. 364, regular forms; Staph. cocci; Lung disease: small moist cavity in right apex, recent extension to right middle, and left upper lobes; V. C. 180; Weight 152.

RESULT: Treated 3 mos.; Temp. 99; Pulse 70; no cough; no expectoration; Lungs: fibroid changes and retraction of right apex, left lung clear; V. C. 205; Weight 168; gained 16 lbs. Disease arrested. Recovered.

CASE No. 2857.

ADMISSION: Temp. 101; Pulse 84; cough moderate; Expect.: 1.5 oz. mucous; Tub. Bac. 12, regular form; Lung disease: both upper lobes; larynx: small tub. ulcer; V. C. 200; Weight 126.

RESULT: Treated 4½ mos.; Temp. 98.4; Pulse 80; no cough; no expectoration; Lungs: left upper clear, right nearly clear; larynx: healed; V. C. 200; Weight 139; gained 13 lbs. Disease arrested. Recovered.

CASE No. 2864.

ADMISSION: Temp. 99.8; Pulse 84; cough slight; Expect.: 1 oz. mucopur.; Tub. Bac. 216, regular form; Lung disease: right upper lobe, recent extension to left side; V. C. 150; Weight 132.

RESULT: Treated 4½ mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: entirely clear; V. C. 210; Weight 141; gained 9 lbs. Recovered.

CASE No. 2865.

ADMISSION: Temp. 100.4; Pulse 84; cough slight; Expect.: 1 oz. mucopur.; Tub. Bac. 360, regular form; Staph. cocci; Lung disease: both upper lobes, slight softening of left side; larynx: small tub. ulcer; V. C. 120; Weight 117.

RESULT: Treated 3½ mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: right side clear, left upper lobe free of rales, fibroid retraction; larynx: ulcer nearly healed; V. C. 180; Weight 133; gained 16 lbs. Lung disease arrested. Recovered.

CASE No. 2870.

ADMISSION: Temp. 101; Pulse 96; cough moderate; Expect. 2 oz. mucopur.; Tub. Bac. 70, regular form; Staph. cocci; night sweats; Lung disease: entire right lung, extension to left apex, cavity in right apex; larynx: tub. infiltration; V. C. —; Weight 128.

RESULT: Treated 2½ mos.; Temp. 99.4; Pulse 80; cough slight; Expect.: 1 oz. mucopur.; Tub. Bac. 84, deg. form; few Staph. cocci; no night sweats; Lungs: left apex and right lower lobe clear; larynx: greatly improved; V. C. 270; Weight 151; gained 23 lbs. Greatly improved.

CASE No. 2875.

ADMISSION: Temp. 99; Pulse 80; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 44, regular form; Staph. cocci; Lung disease: both upper lobes softening, tubercular rectal fistula; V. C. 230; Weight 148.

RESULT: Treated 3 mos.; Temp. 98.2; Pulse 72; no cough; no expectoration; Lungs: left lung clear; fibroid changes in right upper lobe; fistula: improved; operation declined; V. C. 290; Weight 156; gained 8 lbs. Lung disease arrested. Recovered.

CASE No. 2879.

ADMISSION: Temp. 103.4; Pulse 120; cough moderate; Expect.: 4 oz. mucopur.; Tub. Bac. 1108, regular form; Staph. and Diplo-cocci; night sweats; Lung disease: suppur. cavity in right upper lobe, recent dissemination throughout both lungs; Weight 101.

RESULT: Treated 2½ mos.; Temp. 99.1; Pulse 80; no cough; no expectoration; no night sweats; Lungs: both nearly clear, except right apex, cavity dry; Weight 127; gained 26 lbs.; Greatly improved.

CASE No. 2887.

ADMISSION: Temp. 105; Pulse 144; cough severe; Expect.: none, night sweats; Lung disease: acute miliary tuberculosis; V. C. —; Weight 103.

RESULT: Treated 6 mos.; Temp. 98.4; Pulse 84; no cough; no night sweats; Lungs: both clear; Weight 112; gained 9 lbs. Recovered.

CLASS C.

Twenty-one Cases of Pulmonary Tuberculosis in Far Advanced Stages, Prognosis Unfavorable. Treated with Watery Extract of Tubercle Bacilli (von Ruck).

CASE No. 2704.

ADMISSION: Temp. 103; Pulse 108; cough severe; Expect.: 4.5 oz. muco-pur.; Tub. Bac. 308, regular form; Staph. and Diplo-cocci; night sweats; Lung disease; involvement of entire right lung, softening of left apex; larynx; tub. infiltration; Weight 122.

RESULT: Treated 7 mos.; Temp. 99; Pulse 88; cough slight; Expect.: 2 oz. muco-pur.; Tub. Bac. 78, deg. form; Staph. cocci; no night sweats; Lungs: right, middle and lower lobes nearly clear, left apex free from active symptoms; larynx: healed; V. C. —; Weight 148; gained 25 lbs. Greatly improved.

CASE No. 2723.

ADMISSION: Temp. 101; Pulse 88, cough moderate; Expect.: 3 oz. muco-pur.; Tub. Bac. 212, regular and deg. forms; Staph. cocci; night sweats; Lung disease: fibroid changes and retraction in right lung, cavity in right apex, softening in left apex. Tub. fistula in ano.; V. C. 115; Weight 102.

RESULT: Treated 4½ mos.; Temp. 99.6; Pulse 84; cough slight; Expect.: 1 oz. muco-pur.; Tub. Bac. 142, deg. form; Staph. cocci; no night sweats; Lungs: no change in right side, left lower lobe clear, small dry cavity in apex; fistula: no change; V. C. 130; Weight 109; gained 7 lbs. Greatly improved.

CASE No. 2729.

ADMISSION: Temp. 99.4; Pulse 108; cough severe; Expect.: 8 oz. muco-pur.; Tub. Bac. 982, regular and deg. forms; Strepto, Staph. and Diplo-cocci; night sweats; Lung disease: suppur. cavity in right upper lobe, beginning softening in left upper, left lower infiltrated; tubercular testicle; V. C. 155; Weight 137.

RESULT: Treated 4½ mos.; Temp. 99; Pulse 84; cough slight; Expect.: 2 oz. muco-pur.; Tub. Bac. 200, deg. form; Str. and Staph. cocci; no night sweats; Lungs: cavity in right upper lobe nearly dry, small cavity in left up-

per dry, lower lobe clear; Testicle: improved; V. C. 150; Weight 146; gained 9 lbs. Greatly improved.

CASE No. 2740.

ADMISSION: Temp. 103.5; Pulse 120; cough severe; Expect.: 4.5 oz. muco-pur.; Tub. Bac. 900, regular form; Staph. cocci; night sweats; Lung disease: cavity in right upper lobe, beginning softening in left upper; larynx: slight tub. infiltration; V. C. 140; Weight 139.

RESULT: Treated 3 mos.; Temp. 100.4; Pulse 92; cough moderate; Expect.: 2.5 oz. muco-pur.; Tub. Bac. 66, deg. form; Staph. cocci; no night sweats; Lungs: cavity in right upper lobe dry, small cavity formed in left upper; larynx: healed; V. C. 145; Weight 133; lost weight rapidly to 122 lbs.; gained since 11 lbs. Greatly improved.

CASE No. 2750.

ADMISSION: Temp. 101; Pulse 112; cough moderate; Expect.: 6 oz. pur.; Tub. Bac. 44, regular form; Staph. cocci; night sweats; Lung disease: deposits in both upper lobes, softening in left side; Mediastinal abscess; larynx: tubercular ulcer; V. C. 150; Weight 163.

RESULT: Treated 2 mos.; Temp. 100; Pulse 84; cough moderate; Expect.: 4 oz. pur.; Tub. Bac. 44, deg. form; Staph. cocci; no night sweats; Lungs: improved, abscess continues; larynx: much better; V. C. 150; Weight 156; lost weight rapidly first month, gained second month 7 lbs. Improved.

CASE No. 2752.

ADMISSION: Temp. 104; Pulse 120; cough slight; Expect.: 1 oz. muco-pur.; Tub. Bac. 240, regular form; Lung disease: both upper lobes; Tub. peritonitis; V. C. 95; Weight 100.

RESULT: Treated 8 mos.; Temp. 99; Pulse 72; no cough; no expectoration; Lungs: right side clear, left side fibroid changes; peritonitis: cured by operation; V. C. 125; Weight 115; gain-

ed 15 lbs. Disease arrested. Recovered.

CASE No. 2769.

ADMISSION: Temp. 101.2; Pulse 112; cough severe; Expect.: 3 oz. mucopur.; Tub. Bac. 278, regular form; Staph. and Diplo-cocci; night sweats; Lung disease: suppur. cavity in right upper lobe, infiltration of left upper and part of lower lobe; Addison's disease; V. C. 140; Weight 123.

RESULT: Treated 2 mos.; Temp. 99; Pulse 100; cough slight; Expect.: $\frac{1}{2}$ oz. mucopur.; Tub. Bac. 112, deg. form; Staph. and Diplo-cocci; no night sweats; Lungs: left lung improved; Addison's disease: improved; V. C. 150; Weight 128; gained 5 lbs. Improved.

CASE No. 2778.

ADMISSION: Temp. 104; Pulse 120; cough moderate; Expect.: 3.5 oz. mucopur.; Tub. Bac. 566, all forms; Str. and Staph. cocci; night sweats; Lung disease: right upper and middle lobes infiltrated, beginning softening of left upper lobe; larynx: deep tub. ulceration; V. C. —; Weight 120.

RESULT: Treated 8 mos.; Temp. 101.4; Pulse 140; cough severe; Expect.: 5 oz. pur.; Tub. Bac. 390, all forms; Str. and Staph. cocci; night sweats; Lungs: first improved, then Pneumothorax; larynx: grown worse. Died.

CASE No. 2779.

ADMISSION: Temp. 102.4; Pulse 94; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 396, regular form; few Staph. cocci; Lung disease: recent infiltration of both lungs almost complete; V. C. 175; Weight 113, losing rapidly.

RESULT: Treated 3 mos.; Temp. 99; Pulse 86; no cough; no expectoration; Lungs: right upper lobe fibroid changes, rest clear; V. C. 205; Weight 130; gained 17 lbs. Disease arrested. Recovered.

CASE No. 2795.

ADMISSION: Temp. 101.3; Pulse 92; cough severe; Expect.: 5 oz. mucopur.; Tub. Bac. 66, regular form; Staph. cocci; night sweats; Lung disease: left lung softening, fibroid changes and cavity in right upper lobe; V. C. 80; Weight 105.

RESULT: Treated 5 mos.; Temp. 98.4; Pulse 84; cough slight; Expect.: $\frac{1}{2}$ oz. mucous; no Tub. Bac.; Staph. cocci; no night sweats; Lungs: cavity

dry, left lung nearly clear; V. C. 100; Weight 115; gained 10 lbs. Greatly improved.

CASE No. 2803.

ADMISSION: Temp. 102.4; Pulse 96; cough severe; Expect.: 1.5 oz. mucopur.; Tub. Bac. 790, regular form; Staph. cocci; night sweats; Lung disease: both upper lobes, cavity; V. C. 125; Weight 112.

RESULT: Treated 3 mos.; Temp. 100.2; Pulse 84; cough moderate; Expect.: 1 oz. mucopur.; Tub. Bac. 76, all forms; Staph. cocci; no night sweats; Lungs: cavity dry and shrinking, left upper lobe much improved; V. C. 125; Weight 118; gained 6 lbs. Improved.

CASE No. 2809.

ADMISSION: Temp. 100; Pulse 108; cough moderate; Expect.: $\frac{1}{2}$ oz. mucopur.; Tub. Bac. 82, regular form; Staph. and Diplo-cocci; Lung disease: left upper lobe infiltrated, suppur. cavity in right upper, right middle infiltrated; larynx: tub. infiltration; V. C. 150; Weight 142.

RESULT: Treated 3 mos.; Temp. 99.1; Pulse 90; cough slight; Expect.: 1 oz. mucopur.; Tub. Bac. 54, deg. form; Staph. cocci; Lungs: right middle and left upper lobe nearly clear, cavity shrinking; larynx: improved; V. C. 190; Weight 148; gained 6 lbs. Greatly improved.

CASE No. 2810.

ADMISSION: Temp. 101.5; Pulse 96; cough severe; Expect.: 4 oz. mucopur.; Tub. Bac. 126, regular form; Str. and Staph. cocci; night sweats; Lung disease: cavity in right upper lobe, dissemination throughout both lungs; V. C. 100; Weight 144; losing weight.

RESULT: Treated 1 $\frac{1}{2}$ mos.; Temp. 100; Pulse 88; cough slight; Expect.: 2.5 oz. mucopur.; Tub. Bac. 68, all forms; Staph. cocci; no night sweats; Lungs: cavity the same, rest improved; V. C. 160; Weight 148; gained 4 lbs. Improved.

CASE No. 2811.

ADMISSION: Temp. 100; Pulse 112; cough severe; Expect.: 2 oz. mucopur.; Tub. Bac. 108, all forms; Strepto, Staph. and Diplo-cocci; night sweats; Lung disease: recent pneumonia right apex, left upper lobe infiltrated; larynx: tub. infiltration; V. C. 140; Weight 125.

RESULT: Treated 2 mos.: Temp.

99; Pulse 84; no cough; no expectoration; no night sweats; Lungs: fibroid changes in right upper lobe, left upper nearly clear; larynx: improved; V. C. 180; Weight 126; gained 1 lb. Improved.

CASE No. 2819.

ADMISSION: Temp. 102; Pulse 112; cough moderate; Expect.: 2 oz. mucopur.; Tub. Bac. 104, regular form; Str. cocci; Lung disease: right upper and middle lobes, cavity, entire left lung infiltrated; V. C. 135; Weight 105.

RESULT: Treated 2 mos.; Temp 99; Pulse 96; cough slight; Expect.: 1 oz. mucopur.; Tub. Bac. 70, deg. form; Strepto and Staph. cocci; Lungs: left lung much improved; V. C. 150; Weight 112; gained 7 lbs. Greatly improved.

CASE No. 2836.

ADMISSION: Temp. 102.2; Pulse 108 cough severe; Expect.: 4 oz. mucopur.; Tub. Bac. 1208, all forms; Str. cocci; night sweats; Lung disease: recent destructive changes in both upper lobes; larynx: tub. infiltration; Weight 131.

RESULT: Treated 4 mos.; Temp. 98.3; Pulse 80; cough slight; expect.: $\frac{1}{2}$ mucous; no Tub. Bac.; no night sweats; Lungs: both cavities dry, fibroid changes in both upper lobes; larynx: healed; V. C. 165; Weight 149; gained 18 lbs. Disease arrested Recovered.

CASE No. 2838.

ADMISSION: Temp. 101.4; Pulse 112; cough severe; Expect.: 8 oz. pur.-bloody; Tub. Bac. 250, regular form; Staph. cocci; Lung disease: entire left lung and right upper lobe, large cavities in both sides; intestinal tub.; V. C. —; Weight 115.

RESULT: Treated $4\frac{1}{2}$ mos.; Temp. 99.5; Pulse 96; cough moderate; Expect.: 2.5 oz. mucopur.; Tub. Bac. 60, deg. form; Str. cocci; Lungs: left lung greatly improved, cavities the same, intestinal tub. improved; V. C. 160; Weight 135; gained 20 lbs. Improved.

CASE No. 2850.

ADMISSION: Temp. 99.2; Pulse 72; cough moderate; Expect.: 3 oz. mucopur.;

Tub. Bac. 60, regular form; Staph. cocci; Lung disease: fibroid changes in right lung, bronchiectasis, left upper lobe infiltrated; V. C. 135; Weight 133.

RESULT: Treated 3 mos.; Temp. 99.1; Pulse 72; cough slight; Expect.: $\frac{1}{2}$ oz. mucous; no Tub. Bac.; Lungs: left upper lobe nearly clear; Weight 137; gained 4 lbs. Improved

CASE No. 2854.

ADMISSION: Temp. 101.1; Pulse 108; cough severe; Expect.: 4 oz. mucopur.; Tub. Bac. 190, all forms; Strepto and Staph. cocci; night sweats; Lung disease: destructive changes and suppuration in both upper lobes; larynx: small tub. ulcer; Weight 115.

RESULT: Treated $3\frac{1}{4}$ mos.; Temp. 99.2; Pulse 72; cough slight; Expect.: 1 oz. mucous; Tub. Bac. 66, deg. form; Staph. cocci; no night sweats; Lungs: both cavities dry; larynx: nearly healed; V. C. 165; Weight 140; gained 25 lbs. Greatly improved.

CASE No. 2863.

ADMISSION: Temp. 99.3; Pulse 98; cough moderate; Expect.: 3 oz. mucopur.; Tub. Bac. 136, regular form; Staph. cocci; Lung disease: infiltration of both upper lobes and left lower; V. C. 110; Weight 95.

RESULT: Treated $2\frac{1}{2}$ mos.; Temp. 98.4; Pulse 78; cough slight; Expect.: 1 oz. mucopur.; Tub. Bac. 62, deg. form; Lungs: both lungs much improved; V. C. 110; Weight 100; gained 5 lbs. Greatly improved.

CASE No. 2871.

ADMISSION: Temp. 100.3; Pulse 84; cough severe; Expect.: 4 oz. mucopur.; Tub. Bac. 294, all forms; Staph. cocci; night sweats; Lung disease: cavity in left upper lobe, infiltration in left lower and right upper lobes, intestinal tub.; V. C. —; Weight 108.

RESULT: Treated 4 mos.; Temp. 101; Pulse 112; cough slight; Expect.: none; night sweats; Lungs: improved; intestinal tuberculosis grown worse. Only small quantities of the remedy were used and then it was abandoned. Died.

SUMMARY OF RESULTS.

Class	No. of Cases Treated	Average Months Treated	Recovered, Disease Arrested	Per Cent.	Greatly Improved	Per Cent.	Improved	Per Cent.	Grown worse or Died	Per Cent.	Corresponding to
A	20	3	20	100	0		0		0		1st stage
B	37	4	27	73	7	19	3	8	0		2nd stage
C	21	4	3	14.2	9	43	7	33.3	2	9.5	3rd stage
Total	78	3.75	50	64.1	16	20.5	10	12.8	2	2.6	all stages

The same classification has been retained as in previous reports. The cases which are designated as "Recovered" on their discharge showed no physical symptoms in the chest whatever. Where there were still evidences of the previous inflammatory process or healed cavities, the term "Disease Arrested" was added, which, of course, is not indicative of an absolute recovery, but relative only, the best that could be expected under the circumstances.

Among the 78 cases were 14 with tuberculosis of the larynx. In 9 instances of more or less extensive tubercular infiltration of the larynx the infiltration disappeared under treatment in four, was greatly improved in two, and improved in three.

The stage of ulceration was reached in five cases. In one the ulcer was healed; in two others, nearly healed on their discharge; while one case was improved and one grew worse.

In addition to the specific remedy the usual local applications were made, but no curettment or other surgical procedures were employed.

The general improvement in this series of cases may be inferred from the almost uniform gain in weight, all patients but two having shown an increase over their weight on admission, and in many instances the patient was losing more or less rapidly on admission. In class A, all patients gained weight, from 2 pounds to 22, averaging 11 pounds each. In class B, all patients gained from 2 to 44 pounds, averaging nearly 13 pounds each. In class C, 19 out of 21 patients gained from 1 pound to 25 pounds, averaging 10½ pounds each.

A comparison of results obtained without specific treatment and with the various remedies employed was made in my last report, adding to this the 78 cases reported here and treated with Watery Extract, the differences in results appear as follows:

COMPARATIVE TABLE OF RESULTS

OBTAINED WITHOUT AND WITH SPECIFIC MEDICATION.

	Cases Reported.	Recovered. %	Improved %
Without Specific Treatment.....	816	12.1	31.0
Treated with Koch's Tuberculin.....	379	35.5	37.5
Treated with Antiphrthisin and Tuberculocidin.....	182	32.5	46.8
Treated with Tuberculinum purificatum..(von Ruck)	166	43.4	39.2
Treated with Watery Extract of Tubercle Bacilli “	78	64.1	33.3

These results speak for themselves, they were obtained in the same institution and under the same conditions in all respects and justify the conclusion that in the production of the Watery Extract of Tubercle Bacilli as prepared by me, we have made another and most valuable step toward the desired end.

THE DISINFECTION OF THE DOMICILES OF TUBERCULAR PATIENTS.

Attention was drawn at the last meeting of the Provincial Board of Health to the disinfection of the domiciles of tubercular patients. After the matter had been fully discussed the following resolution was carried: “That in the opinion of the Board it should be made obligatory on physicians to report all cases of tuberculosis occurring in their practice; if a physician is not consulted, then this duty should fall upon the householder; that the Local Board of Health should provide for the regular and systematic disinfection of the domicile in which the patient lives and should be notified of the removal of any tubercular case to a hospital or sanatorium.”

This resolution is simply the logical outcome of well-understood medical facts. The mortality reports published in this Journal show that more deaths result from tuberculosis than from all other contagious diseases reported.

As tuberculosis is held to be a contagious disease, communicated principally by the dried sputa of phthysical patients, notification should be given of it just the same as of diphtheria, scarlatina, etc. Notification is the all important step; that once made obligatory by law, disinfection of the domicile or apartment occupied by the patients, would naturally follow. Without notification the Local Board of Health will not disinfect, unless requested to do so. It is quite likely that arguments will be used against the legalizing of notification, and, if phthysical patients were consulted, so radical a measure would never be placed on the statute book. The reason is obvious; a patient once pronounced tubercular by medical authority, is looked upon with dread and occasionally is obliged to change lodgings. Much of this hardship arises from a misconception in the public mind as to the means by which tubercular infection is spread. If the people knew exactly what to do and what to ex-

pect from the Local Health Board, the presence of a tubercular patient in a house would not be looked on with so much dread as it is at the present time. The only remedy for ignorance is instruction, and when people learn from their physicians how, when and where tubercular infection may be conveyed, they will not in any way abate their kindness to the afflicted, while they protect themselves from unnecessary danger.

In order to make people aware of the requirements necessary in managing a case of tuberculosis in a family, public meetings should be held in different parts of the Province, at which addresses on this subject could be delivered by members of the Provincial Board of Health and other prominent physicians. We do not think that too much should be left to the initiative of the local health officers; people should learn to do a little thinking for themselves. Owners of houses should, therefore, see that they are disinfected. People looking for houses or lodging should demand, as a matter of right, a certificate of disinfection before moving in, and every landlord, letting a domicile, should be in a position to assure an incoming tenant that his premises have recently been disinfected. The regular and systematic disinfection of every house in a municipality would be a very practical, modern and effective system of preventing tuberculosis, and should receive the earnest attention of physicians and patients as well.—*Editorial from Canadian Journal of Medicine and Surgery.*

KRESOL-PARA-FUCHSIN STAIN FOR TUBERCLE BACILLI.

Those who have not tried this stain will probably find it much superior to any formula they may have heretofore employed, it is made as follows:

Para-Fuchsin,	-	-	2 parts.
Alcohol,	-	-	q. s.
Kresol,	-	-	1 part.
Distilled Water to make 100 parts.			

Dissolve the Para-Fuchsin in the least possible amount of absolute alcohol, then add one per cent. of Kresol to the distilled water and dissolve it, then add the Kresol water to the alcoholic solution to make 100 parts.

GERMAN CONGRESS FOR THE PREVENTION AND CURE OF TUBERCULOSIS.

This congress meets in Berlin from May 23 to 27th, of this year; the government of the United States has been invited to become interested and to send delegates. An announcement is being prepared by the scientific attache of the U. S. Embassy in Berlin, to be published in the Medical Journals of the United States.

The congress is under the protectorate of the German Empress, Augusta Victoria, and the honorary president is Count Hohenlohe, the chancellor of the German empire.

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KARL VON RUCK, B. S., M. D., EDITOR.

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IMMUNITY IN TUBERCULOSIS.

There can be no doubt that recovery from all contagious and infectious diseases, due to pathogenic micro-organisms, means, that in the course of such diseases a temporary or permanent immunity has been acquired, that is to say, there has occurred a change in the patient under which the specific germ, which caused the disease, can no longer produce its detrimental effects, and finds no longer the condition favorable to its growth and multiplication.

What this change is, no one knows; we can only observe its effect in the difference of behavior of the living body between now and then. In some persons it appears to be naturally present to a degree that they are entirely exempt from certain infectious diseases, while in others this is not the case, unless it is acquired by successfully withstanding the particular disease, or, as in small pox, by protective inoculation.

Relative and variable in degree in different varieties of the human species, and in individuals of the same variety, it appears capable of being influenced by the present state of health, by age, sex, and environment, by internal and external conditions of various kinds, by heredity and by adaptation.

Immunity is never general, thereby affording protection against all kinds of infection, but always special, so that a person may be perfectly resistant against one infectious disease, and not at all against another. Its acquirement during the presence of such a disease is nature's method of cure, and the only salvation from certain death.

Some infections with pathogenic micro-organisms differ, however, amongst other manifestations therein, that they are primarily local and subsequently become general, or that they may retain their local charac-

ter for long periods of time, and in such the change which we call immunity appears to often fail in its occurrence. Such infectious diseases are therefore said to be local or chronic, they do not destroy life excepting in cases where the local pathological changes cause destruction of vital parts, or interfere with functions essential to life.

To this class belongs the disease under consideration in its local and chronic form, and here too, we usually fail to observe the occurrence of immunity with the rapid restoration of the involved parts to their previous structural integrity, at a period when such restoration is still possible.

Experiments upon animals have shown that artificial immunity can occur, and Koch and others have been successful in accomplishing this in so non-resistant an animal as the Guinea pig. Absolute cures of tubercular Guinea pigs in which post-mortem examination showed only fibroid changes and entire absence of tubercle bacilli, as well as protection against virulent infection has been accomplished in the laboratory of the Winyah Sanitarium, the control animals infected at the same time and from the same source, having all developed tuberculosis and died of it in the usual way.

Recovery being possible in the human subject, in the natural course of the disease, sometimes occurring even under unfavorable conditions and environment, and artificial immunity occurring in the animal experiment under the use of the tubercle bacillus substance, in the form of Koch's Tuberculin R, or of watery extract of tubercle bacilli, when properly prepared, and administered, we may yet ask why the natural recovery from local tuberculosis does not take place more uniformly and why it also fails as a rule when the infection is general.

Immunity depending upon the products of the specific germs whatever the disease may be, why do the products formed by the tubercle bacilli in the infected tissues of tuberculous patients so often fail to induce it, not only in local and chronic cases, but also in those where the disease is disseminated?

This question may be answered theoretically with the greater prospect of correctness, since practical experience seems to prove the theory,

which is, that in the local and chronic form, the bacterial activity is not great enough to supply enough of the substance to which the organism responds with the peculiar change called immunity, and that apart from the non-vascularity of tubercle which protects the germs in a measure, the tubercle bacillus though dead, goes into solution with great difficulty or not at all for a long time owing to the large amount of fat contained within its cell walls. If, as Koch has claimed and demonstrated, the TUBERCLE BACILLUS SUBSTANCE itself is necessary for immunity, we can readily conceive that by its resistance to dissolve, the immunizing substance is not available at a time when it is needed, and never present in sufficient quantity to produce a full, lasting effect in the local form of the disease.

Partial immunity or a certain degree of it, may however account for the alternating periods of latency and renewals of the tubercular processes and for extensions to other parts, periods which (unless phthisical processes become established) can be observed with great uniformity in the progress of the purely tubercular disease. Under the occurrence of a certain degree of artificial immunity acquired by the particular patient the growth and multiplication of the specific germ becomes checked and for a time inhibited, and no new tubercles are formed; the present tubercles undergoing either complete absorption, fibroid or caseous degeneration, or if inflammation from any cause supervenes, the caseous tubercles soften.

It is chiefly through the latter occurrence, that new extensions become possible, the partial immunity having been lost, or the natural immunity greatly reduced (which should be expected during the stage of softening) the tubercle bacilli or perhaps their spores become now liberated and transported by the fluids of the body and new tubercles are formed as before.

In acute miliary tuberculosis, the other extreme is probably reached. Here the extensive infection, often involving most organs in the body, represents a many times greater bacterial invasion than we have in the local form, and this is attended by an excessive formation and absorption of the toxic substance. The latter gives rise to high fever, rapid pulse, and

hurried respirations, by the continuance of which the patient becomes quickly and extremely exhausted, favoring the caseous degeneration and softening of the tubercles almost as quickly as they are formed.

The occurrence of immunity after caseation and softening of the tubercles, can however, be of no further use in preserving the life of the patient; and the often observed entire, or almost entire absence of tubercle bacilli in tubercles found post-mortem in the acute miliary form, may speak, indeed, strongly in favor of the occurrence of immunity, and the latter may offer an explanation for their absence. But, as already stated, the immunity is of no avail to the patient, the specific fever gradually merges into the distinctly hectic type, which is due to the absorption of disintegrating tuberculous tissue, and this continued absorption fever is the usual cause of death.

We see therefore, that in Tuberculosis the occurrence of artificial immunity could then only result in a perfect cure, if it were established soon after the bacterial invasion of the tissues, or at least at a period before degenerative changes, especially of the caseous variety have set in. This appears to be rarely the case, probably for reasons already stated. Such instances where it does occur, are not often observed in practice, because the diagnosis is obscure in that formative stage and the patient is usually not even so ill at any time as to receive continued medical attention.

It is therefore in the class of cases where the artificial immunity failed wholly or in part that our professional services are usually required.

Considering the question of immunity from a practical standpoint, we may ask whether we can imitate Nature's method by supplying from artificial cultures of the tubercle bacillus, the required substance and introduce it into the organism so that we produce in a safe manner the reaction and effectually arouse the patient's latent defenses by and through which immunity results. The proposition to do this rests upon a sound, logical and scientific basis, and upon etiological principles which have proved true in other infectious diseases heretofore.

If we are actually in possession of the required substance and if we

can administer it, so that no undue reaction results which itself can become dangerous to the patient, and if we do this at a time when immunity can still be of avail, that is to say, before the patient is doomed to an unfavorable and eventually fatal course by reason of extensive softening, suppuration and general exhaustion, a priori considerations would justify us to hope for success.

That the immunizing substance is contained in the specific germ itself, is shown conclusively by the success of immunization with Tuberculin R, and with Watery Extract of Tubercle Bacilli, and that some of this soluble substance also enters into the culture fluid upon which the bacilli have been grown, appears from the good results (though often short of that which was desired) of its use in the animal experiments, and in human tuberculosis, especially Lupus, where the healing could be directly observed under the administration of the old Tuberculin.

The superiority, however, of the use of the pure tubercle bacillus substance in the form of the Watery Extract over all prior preparations of this character is further attested by unmistakably better results in its clinical employment, and in the animal experiments.

The safety of the procedure being shown by an experience with all stages of tubercular diseases in several hundred patients, without apparent harm, and, as a rule, with subsequent cure, or arrest of the disease, the direct immunization of tubercular patients is about to pass beyond its experimental stage, and promises a great future, in our battle with this formidable enemy of mankind.

Its benefit will become the greater the earlier the disease is discovered, and the Watery Extract being at the same time the most sensitive diagnostic reagent, may help us in the direction of diagnosis as much as it does in the actual treatment.

Its application in phthisical cases can not be expected to directly heal the existing destructive lesions, all it can do is to confer immunity AGAINST THE PRIMARY DISEASE, but never against structural alterations already present, which must be overcome upon the principle of natural tissue repair. If they are fixed and permanent they must remain;

if progressive and not controllable at all, they must destroy the patient in spite even of his acquired immunity.

The best method of inducing immunity with the Watery Extract of Tubercle Bacilli may not yet obtain. So far safety has been so large a question of consideration, that every marked reaction has been carefully avoided by a very gradual increase from most minute doses. A more rapid increase, allowing the patient to react generally, and locally more decidedly, looks promising, and may shorten the time for necessary treatment very materially. It would not be surprising if immunization could eventually be accomplished in as many weeks as it now takes months, especially in latent cases, and in the formative stages of tubercle.

If immunization is resorted to during the period when destructive processes are already initiated and in progress, the patient can not be expected to have the present dead material encapsuled or liquefied, expelled and a cavity formed, limited by healthy tissues, and healed out, all in a few weeks, or even months, and though he may attain immunity artificially in a short time which would remove his non-degenerated tubercles and protect him against the eruption of a new crop, he would still need all that medical science can offer from climatic, hygienic and dietetic methods, to effect his lasting recovery in the healing out of the destructive area.

TUBERCULIN DIAGNOSIS.

A contribution to the subject of Tuberculin Diagnosis in Tuberculosis will be found in the January number of the Journal of the Boston Society of Medical Science by Dr. R. C. Cabot, who reports his experiments, made with the view of determining the influence of a solution of chloride and sulphate of soda in distilled water and of albumoses in causing reactions like Tuberculin in the diagnosis of tuberculosis. For the latter he employed Somatose of which one-fourth grain and three-fourth grain doses were administered to eleven non-febrile tubercular patients. While the salt solution gave no distinct results, ten out of the eleven cases which received Somatose showed fever reactions, the only case which did not react responded to Tuberculin.

The results are in conformity with those obtained by other experimenters, it having been shown that rises in temperature follow the subcutaneous injection of various proteids, in tubercular as well as non-tubercular subjects, the former being however the more liable to respond with fever, and frequently to smaller doses the more decrepit the individual has become in the progress of the disease.

To prove the absence of tuberculosis a single test dose of ten milligrams of tuberculin is considered necessary.

There is, however, an important difference between a specific reaction from Tuberculin, and an ordinary fever reaction from non-specific organic products, such as Somatose, or other beef extracts and peptones, consisting in the selective action of the specific product upon tubercular tissue, which within the course of twenty-four hours becomes turgescient and more or less swollen, whereas no such effect follows the injection of other albumoses.

In Lupus, pharyngeal and laryngeal tubercular affections, and in other visible tubercular ulcerations, this effect is easily seen to occur. Tubercular glands where accessible to touch become sensitive and tender; in the lung the stethoscope gives evidence of more or less congestion and therefore an increase or accentuation of the phenomena previously observed. In lung portions, before considered normal, we may get rough respiration often with slight crepitation, such areas being limited in their outline, corresponding to the presence of tubercle, when the disease is local and circumscribed. Such an influence upon tubercular tissue is termed a local reaction and may occur without fever; and it is this local effect which has always appeared to the writer to be characteristic and specific in its nature, and therefore of more diagnostic value than a simple rise of temperature.

Such local reactions do not occur from the injection of beef peptones, beef extract, nuclein, or blood serum, nor from the blood serum which comes from animals previously treated with germ products, unless in the latter case the serum is taken within a week or ten days of the time when a large dose of the specific germ product has been admin-

istered, but all of these substances may produce temperature rises in tubercular as well as non-tubercular patients.

Tuberculin itself contains the Beef Extract and peptones of the culture fluid from which it is made, but the specific local reaction betokens the presence of some specific substance also, which was formed in the culture fluid during the growth of the culture, and in the light of experiments of more recent years, we have every reason to believe that this specific substance is probably the soluble tubercle bacillus substance itself.

This substance, first isolated in a perfect solution by the writer in 1896, and described by him as Watery Extract of Tubercle Bacilli, is capable of producing local reactions as described in extremely small doses, one one-hundredth of a milligram having been observed to show a distinct effect in a tubercular larynx, and unless a tubercular patient has previously received gradually increasing doses, a fever reaction accompanies the local effect quite uniformly when one-tenth of a milligram is administered for the first time. Inasmuch as no fever can possibly be produced by so small a dose of non-specific proteids, the Watery Extract of Tubercle Bacilli may be employed for diagnostic purposes with greater precision and with absolute freedom from sources of error.

Among the original contributions to this number of the Journal appear two valuable papers on the subject of Tuberculin Diagnosis, by authors of large experience, which deserve the attention of the profession. To their views the writer may add his own, based upon familiarity and study of the subject, adding to the foregoing consideration that an absolutely reliable tuberculin preparation is a pre-requisite to a reliable test. There is a great difference in tuberculin preparations, although made exactly as Koch has first directed, and not only do we find differences in preparations coming from different laboratories, but in different samples from the same laboratory, that of the manufacturers of Koch's Tuberculin included.

The differences may depend upon the amount of soluble tubercle bacillus substance which enters the culture fluid during the growth of

the culture, or upon the varying degree of virulency of the germs in certain cultures or both.

Some cultures require three or four months before they fully mature, so that no further growth can take place upon the fluid, others become checked by decreased alkalinity or by the formation of acid, and others grow more luxuriantly, and, thus the final amount of tubercle bacilli grown, differs considerably in different flasks. The degree of degeneration present in the matured growth is also variable.

Hence it is quite reasonable to suppose that so long as the amount of fluid in each flask is the same, and the growth differs as stated, the final concentration of the fluid from many such flasks to one-tenth bulk does not justify the expectation of uniform strength; on the contrary, variability of different lots of Tuberculin must be expected.

To overcome this variability, and having determined that even quite large doses of concentrated culture fluid upon which no tubercle bacilli have been grown, are not fatal when injected into tubercular Guinea pigs, the writer has endeavored to standardize the tuberculin produced in his laboratory by physiological tests. He found that the minimum fatal dose for a Guinea pig weighing 500 grams, after having been infected four to six weeks prior, and not being as yet decrepit, or seriously ill from the infection, varied from 0.35 c. c. to 1.1 c. c. with different preparations produced by other laboratories and by himself at different times, and a similar but less exact result was obtained when reactions only were sought to be accomplished with a minimum dose.

He therefore adopted the method of additional concentration or dilutions of the various preparations until the results became uniform so that 0.5 c. c. was the minimum dose, which killed such a pig within 48 hours after injection, and has standardized all his tuberculin in this manner.

Next to the use of a standard preparation of known specific strength be that tuberculin, or the soluble tubercle substance itself, the test should be made accurately, and sources of error should be carefully excluded. Having never been in favor of tuberculin diagnosis in all such cases where the diagnosis can be made with a reasonable degree of

certainly without it, cases which have high fluctuating temperatures must certainly be excluded; the more so if the observer expects to depend upon fever reactions for the test. Only cases having approximately normal temperatures or daily uniform rises not exceeding 100.5° F. are suitable, and if structural changes can be shown in the lungs a full trial dose is not permissible at the first test.

This is true in a greater degree should there be suspicion of meningeal tuberculosis.

Thus according to the writer's experience the specific diagnosis should be reserved to obscure cases, in which ordinary methods of examination leave us uncertain, for in such there is no reason to believe that undue reactions will occur, or that the reaction will injure the patient. The stronger the suspicion or evidence may point to Tuberculosis, the more prudent would it appear to make the first test with only five milligrams of tuberculin, or even less, or with 1-20 of a milligram of Watery Extract.

It has, however, been shown that if such a test proves negative, a week or ten days at least should be allowed to elapse before giving a larger, or a full trial dose, in order to allow time to regain full sensitiveness to the test; and if the case is not urgent, an interval of three or four weeks is still better. To apply the test to the patient, after a full examination of the chest, etc., is made and recorded, and his mode of life, exercise, and diet determined, the temperature is taken every two hours during the day, and as frequently as is convenient during the night and recorded. After a 24 hours record is made the trial dose is injected with an aseptic syringe, using a one per cent. solution of tuberculin, or a one-hundredth of a per cent. solution of Watery Extract of Tubercle Bacilli. Of the former solution 1 c. c. contains 10 milligrams of Tuberculin, and a cubic centimeter of the 1-100 per cent. solution of Watery Extract contains 1-10 of a milligram of the tubercle bacillus substance, the injection is made subcutaneously preferably in the interscapular region, where the skin is thick and loose.

If much local irritation follows, so that the part injected becomes red and swollen, this may be attended with fever, and the test is not re-

liable, unless distinct local reaction attends the fever reaction in the suspected tubercular area.

The patient's diet, mode of life, and exercise, must remain the same, and the temperature observations must be continued as on the day before for 36 hours after injection. The fever reaction occurs usually in 8 to 16 hours and it is therefore more convenient to inject either very early in the morning or very late at night, so that the temperature rise may be surely observed. The local reaction occurs as a rule later, and lasts longer, and should be looked for at convenient intervals.

No rise of at least 2 degrees F. having occurred in the temperature over and above the maximum of the previous day, and no local reaction having been observed from the full trial dose, the conclusion is justified that no tuberculosis exists, in the sense, that there is no living tubercular tissue present at this time; a distinct local reaction alone is equally conclusive, but a fever reaction alone of less than 2° F. is positive from Watery Extract of Tubercle Bacilli only and not from Tuberculin. The reason for this difference is apparent. Tuberculin contains glycerine and proteids from the culture fluid, which in themselves can produce fever of a non-specific character; but the small amount of proteids in a trial dose of Watery Extract of one-tenth of a milligram, equal to a six-hundredth and fiftieth part of a grain, cannot do this except by its specific effect.

The method of procedure recommended by Drs. Denison and Taylor is a more gradual one, and is no doubt perfectly safe, and if Tuberculin or Watery Extract is to be used in subsequent treatment, the patient has already had the benefit of the smaller and gradually increasing doses, and has thus saved time, but whatever method is pursued the test carefully employed is perfectly safe, and it would be a pity if the skill and judgment required should not be possessed by any reputable physician, after he has made himself familiar with the method. The writer has never hesitated to apply the test to himself, and repeats it at least once a year, a precaution that any one handling living cultures of tubercle bacilli, in a wet, dry and powdered state, might well adopt.

ORIGINAL CONTRIBUTIONS.

A PLEA FOR THE BETTER APPRECIATION OF THE TUBERCULIN TEST FOR LATENT TUBERCULOSIS.

BY CHARLES DENISON, A. M., M. D., DENVER, COLORADO.

This means of diagnosis needs to be studied, first, to overcome a popular fear of infection resulting from the use of crude tuberculin, and second, to recognize its utility.

As to the probability of infection: It is coming to be recognized that tuberculosis is much more prevalent in a latent or not very active form than heretofore believed. Therefore, when latent tuberculosis has been made manifest by the use of tuberculin, the *POST HOC ERGO PROPTER HOC* argument is conclusive!

Further, the injudicious use of tuberculin in cheesy pneumonias, diffuse miliary infection and acute catarrhal varieties of tuberculosis undoubtedly filled doctors with suspicion, because of the bad results which naturally ensued. We understand that the discoverer of tuberculin himself insisted that its use at the start should be limited to hospital practice, and the patients must be confined to their bed during their reactions. These are provisions (as we understand hospital cases) sure to bring out the detrimental effects of the treatment. The advice was probably Koch's chief mistake, for had he insisted on (1) NO PERCEPTIBLE REACTIONS, involving much smaller doses, (2) TWO OR THREE DAYS' INTERVAL BETWEEN TREATMENTS, and (3) ABILITY TO and NECESSITY TO EXERCISE, sufficiently to keep up successful elimination, even his crude tuberculin would now be highly and generally appreciated as a means of treatment.

The whole process, both the preliminary test and the after treatment with any form of tuberculin, should be looked upon as continually diagnostic, for the recurring after-manifestations are the most reliable guides in the use of the remedy.

This latter feature, this sensitive reactionary effect, is one of the things which I esteem a merit in Dr. von Ruck's *WATERY EXTRACT*, if the physician using it has the proper insight and skill to appreciate it.

But to return to the crude tuberculin. The different State Veterinary Departments have done a work in regard to dosage and number of animals tested which should be very encouraging to the medical fraternity as well as to the laity. To cattle usual doses of 100 to 250 milligrams of the crudest tuberculin are given to each animal. Where the whole herd is treated, as has often occurred, no infection of the non-re-

acting animals has been noticed, that I know of. The State of Massachusetts has a quarantine law against the State of Vermont, requiring all milch cows to be tested with tuberculin before transportation to the former State. The result, in different instances, has been to exclude all affected cows, from one in a car up to half a car load, yet we hear nothing of any bad effects upon the well animals sent out to Massachusetts.

We hear a skeptical layman say "you doctors do not give the tuberculin injections to yourselves!" The imputation would not be here noticed but to show its absurdity. I have known of this self-test being used by physicians on what seemed to me slight indications. Two of my 32 cases mentioned herein were physicians, one (which was reported in the February 3rd issue of the New York Medical Journal, 1894) is that of Dr. O. B. Gould, of Newport, Vermont, where he now lives in continued good health. This was such a sensitive response to tuberculin in a large healthy looking man that I think an account of it will stand repetition here.

1. Dr. O. B. G., of Vermont, aged thirty-eight years. Positive inheritance, his mother and five sisters, out of seven in family, having died of consumption. His wife had died of tubercular meningitis three years previously, from whom he may have been infected, as the disease was general in her. He had had a seton put in the back of his neck twelve years ago for meningitis, which it seemed to relieve, and eight years ago had suffered fracture of the ribs, with septicaemia resulting. Three years ago had la grippe and double pneumonia, chiefly right side. Sick six months. Came then to Colorado for a short stay and gained seventeen pounds in as many days.

On November 20, 1892, after a cough, he had, what was termed basilar meningitis; sick ever since. Headache continuous, and lately very severe up to April 20, 1893, when (having come to Colorado) the following-described relief came: There was no expectoration to examine, and only slight dullness, lessened movement, fremitus, exaggerated voice, and slight broncho-vesicular breath sounds on the right side. The temperature, pulse, and respiration were found to be about regular for two days—98.5 degrees F., 60, and 20, respectively—when one full milligram of tuberculin was injected. The genuine DIAGNOSTIC REACTION did not start till twenty-two hours afterward, and then was chiefly general and not local in the lung. It was manifested by temperature rise to 100.5 degrees F. and pulse to 90, and continued more or less for about fifteen

hours during which at one time he vomited. The day following cessation of reaction a slight increase in dose of tuberculin was given, which was followed, in four to six hours, by a slighter effect than before. By that time the headache had entirely ceased, and the patient, who had been confined in bed for four weeks, was enabled thereafter to be daily out of doors with comfort. The constriction about the base of the brain, which was marked with the first reaction, gradually disappeared. In less than four weeks, after reaching a dose of thirteen milligrams, and feeling well able to do so, the doctor returned to his Vermont home, where he has been engaged in practice ever since. This remarkable case is given as possibly the first diagnosis on record of tubercular meningitis by tuberculin.

TECHNIQUE OF THE TEST.

In the treatment of tuberculosis the skill of the physician depends largely upon his ability to MEASURE THE DEGREE OF INFECTION as well as TO ESTIMATE THE AMOUNT OF RESISTANCE of the patient in each individual case.

Instead of the crude wholesale test employed by veterinarians with cattle a properly graduated tuberculin test of the human subject can be made a delicate estimate (the most sensitive we have) of the DEGREE OF INFECTION. I believe it is effective back to the time of the spore formation, and therefore it is an invaluable evidence of that "pre-tubercular" stage, which is the most important field for study connected with this disease.

My own method is to take a one per cent. solution of the crude tuberculin (Koch's) in a one-half to one per cent. solution of carbolic acid in distilled water. Choosing the region under a shoulder blade as the place for the injection, I draw into my hypodermic syringe 5 to 10 tenths c. c. of the above carbolic acid solution as a diluent and then draw in exactly the dose of the one per cent. tuberculin solution I want. For a commencing dose I begin with one to three-tenths c.c., according to age, sex, and my idea of the susceptibility of the case in hand, and nearly double the preceding dose each day until I get the first reaction. If this is slight, say only one degree Fahr., I wait a day or two and nearly double again, then the diagnosis is complete. If no reaction has occurred up to a 20 to 25 mgr. dose, a negative diagnosis may be assumed to be established. This reaction will be shown in an extra rise in temperature of from one to five degrees. Of course the patient has been provided with a thermometer, and has for two days previous to the test kept a record of

his temperature, preferably, I think, at the hours of 9 a. m., 1, 4, and 8 p. m. The diagnostic effect (aside from the grippy-headachy result and systematic reaction) will sometimes be shown, at a point in the lung slightly involved and not before recognized, by a peculiarity of breathing, which I believe I was the first to call attention to; namely, A PUE-RILE, HIGH PITCHED AND DRY SORT OF BRONCHO-VESICULAR BREATH-SOUND, perhaps limited to an affected area. It is an encouraging sign, so far as prognosis goes, compared with the moist or catarrhal rales, especially those produced out in the lung periphery by the act of coughing, for in due time the breathing will become softer and probably without rales, if this slight specific reaction is kept up as a form of treatment.

A good way to average the results of this test and determine its utility would be for each one to give a resume of his own cases.

I have looked up thirty-two cases as I could find them or call them to mind.

CLASSIFICATION OF TESTS.

DIVISION.	NO. OF CASES TREATED.
1. Ordinary—apical dullness, wasting anaemia, winter cough, etc., slight signs and no satisfactory expectoration for examination.	6
2. Lupus	2
3. Glandular (neck) and suspicious premonitory lung symptoms..	3
4. Internal—large tumor of kidney.....	1
5. Suspicion of tubercular testicle—cystitis or nephritis.....	3
6. Suspicious joint cases—with or without complications.....	3
7. Suspicious remarkable hypertrophy—recurring on excision—of tonsils... ..	1
8. Anaemia and chronic pneumonia in syphilitic cases.....	2
9. Bronchiectasis and bronchorrhoea.....	5
10. Ulceration in colon.....	2
11. Suspicious tubercular pleurisy.....	2
12. Meningeal trouble with nervous complications.....	2
Total.....	32

All these were positive diagnoses of tuberculosis, except one in first, one in eighth, and three in ninth, division above.

As to the Bronchorrhoea cases, when one estimates how responsive tubercular pleurisy cases are to this test (where all the toxins are retained concealed in a sensitive area) the suggestion is strengthened which has

occurred to me, namely, that in the bronchiectic cases the toxins are perhaps washed out of the system in the accompanying bronchorrhoea.

These cases tested were all of more than usual interest to the physician, and some of them have been reported ("Favorable Results of Koch's Tuberculin Treatment in Tubercular Affections that are not Pulmonary," New York Medical Journal, August 3rd, '95), but two of them here described show the great advantage of the test in fixing the responsibility for symptoms not otherwise explained.

2. H. N. H., a young lawyer from Tennessee, in his sixth year as a resident of Colorado, no inheritance to tuberculosis, but small of stature, never strong when young, and had chills and ague in youth, and overwork at school and afterwards in office work. Two years ago had a severe cold with pain in chest and a succession of colds afterward with tonsillitis six months ago, usual weight 125 pounds, but came to me October 16, 1898, weighing 117 pounds, as he "had been refused insurance because of lung trouble." There was poor circulation and a weak throat but no expectoration, no night sweats or fever. Physical examination of the chest showed fine rales on deep breathing with some dullness and broncho-vesicular sound in second inter-space right infra-clavicular region, with exaggerated voice and whisper and slight sibilant rales back of same in inter-spinatus region.

November 11th a tuberculin test on the plan above described gave two degrees rise to two milligrams, and a rise to 103 3-10 degrees to a four milligram dose.

This gentleman has steadily improved since, on systematic exercise and scattered doses of von Ruck's Purified Tuberculin, and later of his Watery Extract. The progress, however, is necessarily slow because of his remarkable susceptibility to the tuberculin effect and the time required for results from his chest-exercises (Swedish method). The gain in weight has been nine pounds, and his strength and ability to work has doubled in the last three months. Auscultation shows the steady drying and opening up of his obstructed lung area.

3. L. T. S. This case is interesting because it furnished an ocular demonstration of the tuberculin effect.

A young lawyer, twelve years resident in Colorado, having come from Wisconsin because of pulmonary hemorrhages, etc., and apparently recovered, but had had a fistula-in-ano for three years which, September 10th, 1898, the time of examination, remained unhealed. Very few chest signs except the exaggerated voice sound and other auscultatory

evidences of probably arrested fibro-tuberculosis. He had, however, run down from 143 to 116 pounds weight, was deficient in chest expansion, spirometrical measurement and especially the manometer record. June 1st, I had extirpated a rapidly growing and very large left tonsil, which in the interim to September 1st, had grown as large again and was extending both downwards and upwards. The resistance to the usual effect of Iodine locally applied, determined me to try the tuberculin test, which I did two weeks after excission, which operation, though thorough, did not arrest the hypertrophying tendency. The reaction was characteristic as a medium large dose (15 milligrams) was reached and improvement in the throat was soon manifest; we could see the shrinking away of the hypertrophied tissue.

In the next three months, by very gradual increases, 1 c. c., full strength of the "Watery Extract of Tubercle Bacilli," was reached as the maximum dose, when the case was discharged in fine condition, as to weight, strength and blood state.

It seems to me that such cases of latent or partially cured tuberculosis are especially favorable for the tuberculin treatment. The previously acquired resistance to continued self-infection seems to leave a reserve of healing susceptibility or tendency, which only needs the stimulation by the specific agent used, to be coaxed into activity.

I shall be gratified and rewarded for my pains if these observations and illustrations shall lead some of the many skeptical physicians to further study this neglected agency (crude tuberculin) in the light of its splendid diagnostic power.

With the possible exception of an unusual intuition, supported by an extended experience with the tubercular half (?) of failing humanity, there is no known means, not the most perfect and well understood stethoscope or skillful technique of blood examination, which equals this delicate tuberculin test for the diagnosis of that indefinite and yet-to-be-understood state, the "pretubercular" stage of tuberculosis.

Denver, Colorado, March 20th, 1899.

THE TUBERCULIN TEST IN THE EARLY DIAGNOSIS OF TUBERCULOSIS

BY H. LONGSTREET TAYLOR, A. M. M. D., MEMBER OF THE AMERICAN CLIMATOLOGICAL ASSOCIATION; LARYNGOLOGIST AND RHINOLOGIST TO THE CITY AND COUNTY, AND BETHESDA HOSPITALS, ST. PAUL, MINN.

The advantages of an early diagnosis in tubercular disease of any organ, but especially of the lungs, is a matter of general knowl-

edge, nevertheless this advantage is one so seldom enjoyed by patients that the reasons for this failure should be studied most carefully.

Tuberculosis, in one form or another, is more widely distributed among civilized races than any other disease. Fifteen per cent. of the total mortality is computed to be due to it. Forty to fifty per cent. of autopsies made upon those dying of other diseases reveal evidences of former tuberculosis. It is probable that many more have had tuberculosis in a mild form which has left no trace that we can detect by the ordinary method of making autopsies.

Compare for a moment this vast number of tubercular cases with the comparatively small number of recognized cases, and the fact stands out most clearly that our diagnosis of such cases is extremely faulty.

The first rule of diagnosis that the profession then should adopt is to regard every case of a chronic nature or obscure origin as tubercular. To exclude tuberculosis in every obscure case, just as syphilis must be excluded in cases of long standing headache, when no other cause is apparent, should be the daily practice of every physician. Let the golden rule be eternal vigilance. Suspect every chronic case of being guilty of harboring tuberculosis until its innocence has been established.

The beginnings of tuberculosis are daily being diagnosed as the most various conditions until the entire nosology at one time or another has been used to cloak the ignorance of the profession as to the true state of affairs. It should rather be termed negligence, as it is possible for every one with sufficient diligence to make an early diagnosis and thus save many lives.

As Dr. E. Boeckman so truly says (St. Paul Medical Journal, February, 1899, page 105) tubercle bacilli have a special affinity for lymphatic glands, the same affinity as criminals have for prisons, therefore the first step should be to carefully examine for enlarged glands, and for pathological conditions in the mucous, serous, and synovial membranes, in which the lymphatic system has to a large extent its beginnings. The lymphoid tissues in the vault of the pharynx, the tonsils, the mucous lining of the nose and the larynx, the bronchial and the post peritoneal glands, the peritoneum, the pleural membranes and the joints, the urine, with special reference to the amount of coloring matter, and the blood state.

Any digestive disturbances should receive special attention, as in many cases they proclaim the presence of tuberculosis before any other danger signals have been displayed.

Now comes the physical examination of the lungs, and how often it is unsatisfactory and even misleading. If there is sufficient consolidation to produce dullness, then the golden opportunity of an early diagnosis has been lost, if rales are present and tubercle bacilli are found in the scant expectoration, the tubercles are breaking down and some have opened into the air passages, this then cannot be called an early diagnosis. A chronic limited pleurisy may be discovered, which is practically always tubercular. Areas of cog-wheel or jerky respiration may mean tuberculosis but are just as apt to be due to other causes, many of them of no consequence.

Observations of the temperature are invaluable and while a slight daily rise, especially with accelerated pulse rate, may be very suggestive yet it is not absolutely positive. It is in those cases that have the insidious mode of onset that the remarks most aptly apply, and in those that begin as a bronchial catarrh.

When an attack of pleurisy is the beginning of the consumption or when tuberculosis develops in the remains of an old pleurisy the history should at once so fix the physician's mind on the probable consequence that at least a probable diagnosis should be made early.

When a pulmonary hemorrhage is the first intimation the patient has that he is not in good health, it should be regarded as of tubercular origin—as it practically always is so. The question of the possibility of a laryngeal origin is generally conceded, and here the diagnosis should not present many difficulties if a laryngologist examines the patient at the very first symptoms of irritation in the throat.

Any diagnosis that has been made by the methods mentioned, if an early one, must be uncertain. The presence of tubercle bacilli is of course pathognomonic, but nothing else is absolutely so. It can be made with a certain degree of probability but the patient prefers to be called a neurasthenic or a dyspeptic. Hence the necessity of a test that is positive, and for one with which a negative result proves the absence of tuberculosis, such a test can be found in the diagnostic use of Koch's original tuberculin, tuberculinum crudum.

Dr. F. W. White (Boston Medical and Surgical Journal, August 5, 1897), in a careful study of 123 cases that received diagnostic injections of tuberculin concludes that an absence of the reaction indicates almost universally an absence of tuberculosis, and that the occurrence of a reaction indicates the presence of tuberculosis more than four times out of five. This seems a very low estimate as these cases that react without

being tubercular, if too large a dose has not been given, must be either syphilitic, actinomycotic, or leprosy. On this point Dr. A. C. Klebs (Boston Medical and Surgical Journal, February 10, 1898) says that such reactions are less intense; Prof. Wm. Osler, (American System of Practical Medicine) says they detract but little from the value of the test; while Prof. J. T. Whittaker holds (International Medical Magazine, October, 1897) that in these positive cases there is in conjunction with the actinomycosis or leprosy, tuberculosis, as has been demonstrated. We know also that lepers are particularly predisposed to tuberculosis. Another objection is that there is supposed to be danger of dissemination of the bacilli and consequent scattering of the disease into all the organs of the body. But this is a theoretical, not a practical, objection. No one who has ever used the test has reported such a result.

In the years that have elapsed since Koch gave us tuberculin and at the same time pointed out its wonderful powers as a diagnostic agent, no one has been able to disprove its action in this regard. The reliability of this method of diagnosis has been demonstrated in the practice of veterinarians by their wholesale injections, condemnations and post mortem examinations of cattle. In his article referred to above Dr. White says that the error in their cases is only one per cent. No reason can be given why these uniform results on cattle and on the numerous small animals ordinarily used in laboratory work should not be equally reliable in man.

We find Van Jahsek at the Congress fuer Innere Medicin, 1891, advocating the use and extolling the efficiency of this test.

Dr. Charles Denison says (New York Medical Journal, February 3, 1894): "In these uncertain and doubtful cases tuberculin has the power to bring to our knowledge their true nature and extent with precision and gratifying certainty."

Dr. Krause (Deutsche Med. Wochenschrift, 1895), wonders what succeeding generations will think of a profession that refuses to use a scientific test to aid them in the proper understanding of their cases.

Dr. Sandberg, surgeon of the Bergen Hospital, (British Medical Journal, 1896), concludes that tuberculin is a reliable diagnostic agent in surgical tuberculosis.

Prof. Jas. T. Whittaker recited his extensive individual experience to the Congress of American Physicians in 1896, and in an article in the International Medical Magazine, October, 1897, he says: "The highest value of tuberculin is the diagnostic value which is supreme, and which

enables us to distinguish the disease at the start as a tuberculosis before the development of sepsis and the other complications which go to make up that composite picture we call phthisis."

Dr. Trudeau urges its adoption in an article in the *Medical News*, May 29, 1897, with the report of the cases on whom he has used it at the Saranac Lake Sanitarium.

Prof. Koch says: (*Deutsche Med. Wochenschrift*, April 1, 1897), "The most valuable property of tuberculin is, that injected subcutaneously in very minute doses it gives rise to a characteristic reaction in persons and animals affected with tuberculosis. The use of tuberculin as a diagnostic agent, a fact which I emphasize in my first publication on tuberculin, has more and more held true in the course of time. The apprehension that, following the reaction, the tubercle bacilli might become unfettered and transplanted into healthy parts of the body, has proved to be futile in the many thousand injections into cattle made for the purpose mentioned. This fully agrees with my own experience in more than a thousand cases, in which tuberculin was used for an early diagnosis of tuberculosis. Here, too, in not a single case the slightest indication pointing to an unfettering and transplanting of tubercle bacilli could be observed. With such experience at one's command, one ought to abandon the silly prejudice of the unfettered bacillus and make use of the diagnostic value of tuberculin."

The test is particularly sensitive at the very time when the diagnosis is most valuable, that is in the condition of latent tuberculosis or in the pretubercular stage; it is not very sensitive in advanced tuberculosis, when, however, it should never be necessary to make use of it, or in an old local tuberculosis. The diagnostic dose should be increased at short intervals until the limit is reached which can be given to a healthy individual without producing fever. Even if fever should result from an over-dose and no local reaction take place, the physician should not be led astray. Before giving tuberculin for this purpose, it is indispensable to have an accurate two-hourly temperature chart made for two or three days, in order not to be misled by any daily rise in the temperature. The first dose should be one milligram; after the lapse of several days two and one-half milligrams should be given. The third dose should be five and the fourth dose ten milligrams. When no reaction occurs, or with the largest dose slight fever without any local reaction, the patient can very safely be declared free of any tuberculosis.

By local reaction is understood those changes which take place in

tubercular tissue under the influence of a large dose of tuberculin. In the larynx the increased congestion and swelling can be seen; in the joints it is at once apparent; in the lungs there is an exaggeration of any previous roughness in the vesicular murmur, and often the area of roughened breathing increases in extent, mapping out clearly the limits of the infected area. The general reaction is shown by a rise in the temperature of a degree or more, by headache, sense of constriction in the chest, rapid pulse, nausea and at times diarrhoea. The local reaction should always be detected and its extent carefully noted.

Dr. Malm, of Norway, who has studied tuberculin very thoroughly and written an authoritative work upon the subject says that the first diagnostic dose should be one milligram.

Drs. Grasset and Vedel (*Semaine Medicale*, 1896), use from one-fifth to one-half milligram. While they obtain reactions, yet they are very apt to miss some cases, as shown by the writer's experience.

Prof. Whitaker begins with five milligrams and pushes the dose to twenty-five milligrams, as does also Prof. Maragliano (*Berliner Klin. Wochenschrift*, 1896). Unless very careful to look for local reactions, such doses might mislead by causing fever in healthy subjects. Dr. Denison begins with one milligram and believes ten milligrams to be sufficient for the maximum dose.

Dr. Northrup (*Medical News*, vol. 72), reports 61 cases. He used one milligram. His conclusion is that further study is necessary for the purposes of determining the dosage and methods of administration, and when these points are settled that the tuberculin test will prove to be a material aid in the diagnosis of latent tuberculosis.

Dr. A. C. Klebs (*Boston Medical and Surgical Journal*, February 10, 1898) uses doses increasing from 0.5 to 10.0 milligrams. Dr. F. W. White (*Boston Medical and Surgical Journal*, August, 1897) discarded all smaller doses and depended on a single dose of ten milligrams. Dr. G. G. Sears (*Boston Medical and Surgical Journal*, August 1897) used one milligram and had nine reactions in testing ten cases of pleurisy.

The writer's case book contains the accounts of 51 cases to whom diagnostic injections have been given. The youngest was an infant in arms, to whom two small doses were given without a reaction. The condition proved afterward not to be tubercular. The result was positive sixteen times. The negative cases have not developed tuberculosis except in two cases and in these the dose given was too small to be final. One of the negative results was in case of tarsal inflammation in the prac-

tice of Dr. Gillette. The operation showed it to be non-tubercular. Eight of the sixteen positive cases reacted to the first dose of one milligram, six reacted to doses of between two and three milligrams, one reacted to the five milligram dose and one to the ten milligram dose.

Other substances have been proposed as substitutes for tuberculin, but Dr. R. C. Cabot (Journal of the Boston Society of Medical Sciences, 1899) reports that they are not reliable. One solution consisted of the chloride and sulphate of sodium in water, and the other was an aqueous solution of Somatose. This last solution was used to test the statement made by Methes in 1894: that albumoses would produce a reaction in tubercular patients. Cabot states that the use of somatose, while somewhat more successful than that of the salt solution and deserving of further study has not shown that the regularity of its action is at all comparable to tuberculin.

REPORT OF TWELVE CASES OF PULMONARY TUBERCULOSIS, TREATED WITH "WATERY EXTRACT TUBERCLE BACILLI."

BY JOHN HEY WILLIAMS, M. D., ASHEVILLE, N. C.

I have to regret, in making this report, the limited number of cases which comprise the clinical material. I have thought best, however, to report only those cases which have been discharged from treatment for a sufficient length of time to allow me to form some opinion as to the actual results obtained.

Since the announcement of Koch's method of treatment of tuberculosis with the culture products of Tubercle Bacilli, I have used specific remedies in my practice with increasing confidence in their helpful influence in securing permanent recovery in my patients. I have endeavored to accomplish something more than a mere temporary arrest of those active processes and conditions which, in the majority of cases are sooner or later followed by relapse and renewal of the disease, especially when the patient renews his former mode and habits of life, is subjected to the former environments and has passed from under strict professional surveillance, when he is again away from favorable climatic influences and is free to pursue his own course.

I have been encouraged, by finding that, under conservative use, the employment of the products of the specific germ is perfectly safe, and in no instance has it been followed by undesirable results. Through the courtesy of Dr. von Ruck, I have had free and constant access to his laboratory, and have thus been enabled to observe the method of the

production of the remedies, and to follow his experimental work upon animals. The knowledge so obtained increased my confidence and enabled me to form some judgment of the value of the remedies before using them in my own practice.

Prior to my use of the Watery Extract, I had largely used the various products of the laboratory of Koch, Klebs, and others, and, though I recognized a certain value, yet, to some extent I was disappointed with the results obtained, and I have been, for some time, of the opinion that the search was not so much for an anti-toxin as for the toxic immunizing principle of the Tubercle Bacillus itself.

I do not think that we need an anti-toxin as we have in the serum for diphtheria, for instance, where above all things, we wish to gain time to allow the vital forces to rally their fighting cohorts, in other words, in diphtheria we want an antitoxine to prevent death from the excessive formation of toxins.

It is well known that in pure, unmixed, circumscribed tubercular infection, the toxic effect of the specific germ is small, and not sufficient to fully arouse the restorative forces of the body. I may be controverted in this opinion, and am open to conviction. When Dr. von Ruck first announced to me, in 1896, the inception of his work, I felt that a great step was being taken toward the perfection of all the work in this line. Having thus watched the method of production of the remedy from the first inception to its present state of greater perfection, and, having seen the encouraging features of the animal experiments, I have pinned my faith to the present product, as being far in advance of all that have gone before.

After the experimental work was finished, and I was convinced of the safety and superiority of the remedy, I abandoned the use of the purified tuberculin, feeling that I had unmistakable evidence that the substance of the bodies of the tubercle bacilli, was the most active and potent agent for the immunization and cure of tubercular diseases.

In the use of the Watery Extract for the purpose of producing immunity, I find that the nature and stage of the disease limits the benefits to be expected. The most favorable cases are those in the incipient and earlier stages, when the disease is limited in area, and when softening is not yet in progress. In such cases, climatic and hygienic methods have accomplished all they could, and their continuance is simply a matter of preventing relapses from breaking down of deposits formed and now existing in a latent state, a permanent recovery

depending upon the final occurrence of fibroid changes in the deposit, which, if it occurs at all, is a matter of many months and even years.

Physical examination of the involved latent area, continues to show the presence of structural changes, which, as indicated, tend eventually toward fibrosis, if nothing intervenes to cause renewed inflammation. Unfortunately, such interventions occur so frequently from exposure, acute bronchial attacks, grippe and other causes, that such patients need to continue in favorable climatic localities.

Under the use of Purified Tuberculin, and notably under the use of the Watery Extract of Tubercle Bacilli, I have been able to cause the gradual disappearance of such tubercular deposits either in part or entirely, and often so that no abnormal phenomena were present upon the most careful examination of the chest. In older and more advanced cases, or such as came under my observation with active symptoms, I could observe only the disappearance of perhaps more recent infiltrations or extensions, leaving nothing but prior fibroid changes recognizable on examination.

No other treatment, beyond the general hygienic and dietetic methods have been used in the cases reported by me, excepting occasional prescriptions for troublesome symptoms.

Having had an experience of nearly two years with the Watery Extract, and several years with the use of antiphthisin and purified tuberculin, in the light of my experience of many prior years, during which I made use of no specific medication, I feel confident that I am entitled to reason *POST HOC PROPTER HOC*, and that their use stands in relation to the unusually favorable changes observed during their administration. Frequent examination of the sputum showed the gradual degeneration, and, in most instances, the entire disappearance of the tubercle bacilli, until finally no sputum was present at all. With the subsidence of symptoms, especially of fever and cough, a marked influence on the circulation became manifest, the pulse becoming full and slow, while the nutrition improved so that there was a uniform and remarkable gain in weight.

In cases, however, in which the patient is already much exhausted from long continued fever and suppuration, and in which their continuance *MUST LEAD TO AN UNFAVORABLE ISSUE IN THEMSELVES*, the use of specific remedies is of no avail; a conclusion at which I have arrived from a priori consideration, which tentative trials in far advanced cases have amply confirmed.

From the following report of my class of twelve cases, my readers may judge of the correctness of my conclusions. I have recently seen, or heard from, all them.

CLASS A.

Case 136, came under treatment October, 1897—girl 13 years, approaching puberty; one aunt on father's side died of tuberculosis, father still living but tubercular. Has had two attacks of pneumonia. Temp. 99; Pulse 96; cough slight; Expect.: muco-pur.; not examined for Tub. Bac.; had night sweats; Weight 72 lbs.; Lung disease; right upper lobe, stage of infiltration.

RESULT: Treated 3 mos.; Temp. normal; Pulse 74; no cough; no expectoration; Lungs: absolutely clear; Weight 86 lbs; gained 14 lbs. Recovered. Present condition March, 1899, excellent health—puberty established.

Case 151, came under treatment November 1897; Mr. C., Supt. of Tracks, Southern Ry., age 37; had grippe in July, '97—frequent hemorrhages. Temp. 99; Pulse 90; cough moderate; Sputum mucons bloody; Tub. Bac. 26, regular forms; Staph. and Diplo-cocci; Weight 116 lbs.; Lung disease: right upper lobe stage of infiltration.

RESULT: Treated 6 mos.; Temp. 98.2; Pulse 70; no cough; no expectoration; Weight 122; gained 6 lbs; Lungs: entirely clear. Recovered. Present condition, March, 1899, vigorous health.

Case 152, Mrs. L., of Pa., age 42, came under treatment November, 1897—hemorrhage 6 months prior. Temp. 100; Pulse 120; cough severe; Expect.: muco-pur.; Tub. Bac. 52, regular and some deg. forms; Staph. and Diplo-cocci; Weight 108; Lung disease: entire right upper lobe, beginning infiltration of left apex.

RESULT: Treated 3 mos.; remarkably tolerant to the extract, taking daily doses of 1 c. c. of No. 10; Temp. 98.4; Pulse 78; cough slight; Expect. slight mucous; contains no Tub. Bac.; few Staph. and Diplo-cocci; Weight 116; gained 8 pounds; Lung condition: fibroid change in right apex, left apex clear. Disease arrested. Recovered. Present condition good; weight February 22, 1899, 122 lbs.

Case 156, Mrs T., of Indiana; age 34, family history good; spleen much enlarged from malaria; came under treatment December, 1897. Temp. 100; Pulse 90; cough moderate; Expect.: slight muco-pur.; Tub. Bac. 236, regular forms; Staph. and Diplo-cocci; Weight 114 lbs.; Lung disease: left upper lobe to 4th intercostal space, spleen much enlarged.

RESULT: Treated 4 mos.; Temp. normal; Pulse 76; cough rare; Expect.: very slight muco-pur.; few cocci; no Tub. Bac.; Weight 124 lbs.; gained 10 lbs.; Lungs: clear, spleen nearly normal. Disease arrested. Recovered. As to present condition her husband, who is physician, writes me that her health is excellent. Examination shows no tubercle bacilli.

Case 170, Mrs. F., of Maryland; age 52, father and mother died of pneumonia, one cousin died of phthisis. Temp. 101; Pulse 108; cough moderate; Expect. slight muco-pur.; Tub. Bac. 64, perfect forms; Staph. cocci; Weight 126; Lung disease: left upper lobe, and to fifth intercostal space, beginning disease in right apex.

RESULT: Treated 3 mos.; Temp. 98.6; Pulse 74; cough rarely; no expectoration; Weight 138; gained 12 lbs.; Lung condition: right apex clear, left apex slightly dull, fibroid, all other parts clear. Disease arrested. Recovered. Condition January, 1899, good.

Case 176, Mr. H., railroad clerk; came under treatment February, 1898, family history good; had measles followed by grippe two years ago, and hemorrhage a few days before examination. Temp. 99.6; Pulse 96; cough slight; Expect.: muco-pur.; Tub. Bac. 6, regular forms; slight night sweats; Weight 106; Lung disease: right upper lobe to 3rd intercostal space.

RESULT: Treated 4 mos.; Temp. normal; Pulse 70; no cough; no expectoration; no night sweats; Weight 118; gained 12 lbs.; Lung condition: lungs entirely clear. Recovered. Present condition, March, 1899, in excellent health.

Case 190, Mr. H., of Indiana, printer, age 25, family history good, except a cousin who has tubercular laryngitis. Temp. 100; Pulse 100; cough moderate; Expect.: muco-pur.; Tub. Bac. 74, regular; Staph. and Diplo. cocci; Weight 122; Lung disease: both upper lobes.

RESULT: Treated 3 mos.; Temp. normal; Pulse 74; no cough; no expectoration; Weight 134; gained 12 lbs.; Lungs: entirely clear. Recovered. Present condition, March 14, 1899, excellent.

CLASS B.

Case 166, Dr. J., of New York, age 36, had grippe followed by pneumonia. Temp. 100; Pulse 96; cough moderate, Expect.: muco-pur.; Tub. Bac. 274, regular and deg.; Strepto, Staph. and Diplo-cocci; occasional night sweats; Weight 116 lbs.; Lung disease: upper right lobe, beginning of middle lobe, cavity right side.

RESULT: Treated 4 mos.; Temp. 98.6; Pulse 76; no cough; no expectoration; no night sweats; Weight 132; gained 16 lbs.; Lung condition: fibroid changes right upper lobe, cavity dry, middle lobe clear. Disease arrested. Recovered. Condition January 10th, 1899, good.

Case 169, Mr. E., of Brooklyn, N. Y., civil engineer, age 21, father died of tuberculosis, one aunt, father's side, tubercular. Temp. 101; Pulse 100; cough moderate; Expect.: moderate muco-pur.; Tub. Bac. 78, regular form; Staph. and Diplo-cocci; occasional night sweats; Lung disease: whole of left upper, beginning softening, small cavity; Weight 124.

RESULT: Treated 4 mos.; Temp. 99; Pulse 80; cough slight; Expect.: slight mucous; Tub. Bac. 4, on a slide; few Staph. cocci; Weight 136; gained 12 lbs.; Lung condition: fibroid changes in left apex, cavity dry. Greatly improved. Spent last summer in Adirondacks, reports present condition same as when he left Asheville.

Case 175, Mr. T., of Ontario, Canada; family history good, personal history: close confinement in badly ventilated offices, exposures to cold; came under treatment February, 1898. Temp. 101.2; Pulse 108; cough moderate; Expect.: muco-pur.; Tub. Bac. 26, regular form; Strepto and Staph. cocci; Weight 138; lung disease: left upper lobe, moist cavity in apex, right middle lobe.

RESULT: Treated 4½ mos.; Temp. normal; Pulse 76; cough slight; no Tub. Bac.; few Strepto and Staph. cocci; Weight 144; gained 6 lbs.; Lung condition: left upper lobe, cavity dry, dullness only above 1st intercostal space, lower part clear, right middle lobe clear. Greatly improved. Present condition, March 10, 1899, very good.

CLASS C.

Case 114, Mrs. C., of Michigan; age 41, family history on father's side bad, father, two uncles and two aunts died with tuberculosis; mother's side good; personal history: Oophorectomy in 1894, followed by septic fever with slow recovery; patient has had several hemorrhages; was first treated with Purified Tuberculin from which she improved and spent summer at home; came again under treatment Fall, 1897, and treated with Watery Extract. Temp. 102; Pulse 120; cough severe; Expect.: profuse purulent; Tub. Bac. 314, deg.; Strepto and Staph. cocci; night sweats; Weight 99; Lungs: both upper lobes, right side softening, large cavity below clavicle, right middle lobe, tubercular disease of nasal septum perforated.

RESULT: Treated 1 year; Temp. normal; Pulse 74; slight cough; no expectoration; last exam. no Tub. Bac.; no cocci; no night sweats; Weight 116; gained 17 lbs.; Lung condition: left lung clear, fibroid changes in right upper lobe, cavity dry, other parts clear, nose healed. Disease arrested. Recovered. Present condition, March, 1899, that of robust health.

Case 168, Miss S., of New Jersey, age 17. Temp. 103.5; Pulse 112; cough severe; Expect.: profuse muco-pur.; Tub. Bac. 142, regular forms; Strepto, Staph. and Diplo-cocci; night sweats; Weight 98 lbs.; Lung disease: entire left lung, right upper lobe, cavity.

RESULT: Condition was so bad that she was only treated tentatively, no hope was entertained; after three weeks she was advised to return home, where she died.

THE CARE OF THE DIGESTIVE TRACT IN TUBERCULAR PATIENTS.*

BY H. J. CHAPMAN, M. D., HOUSE PHYSICIAN WINYAH SANITARIUM,
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One of the most important predisposing causes of tuberculosis is the lessening of the natural resisting power of the organism, and this is but another way of saying that the nutritive processes are deficient.

If such a state is not apparent at the onset, the subsequent pathological changes tend strongly toward it, and invariably increase it if already present. Indeed the prognosis in a given case very often depends upon the patient's ability to assimilate food in sufficient quantity not only to supply the demands of the system each day, but also to increase the amount of defensive proteids for that individual.

Many cases with only a moderate amount of lung involvement fail to recover for lack of assimilative power. With good digestive organs, our chances for success are favorable. Without it, we can do little or nothing, no matter what may be our method of treatment of the tuberculosis.

Among the various causes that give rise to defective nutrition improper feeding stands at the head.

In many instances this fault, commenced early in childhood, tends to gradually impair digestion and assimilation, and though perhaps not to such a degree as to occasion any serious alarm, yet sufficient to account for a greater predisposition to the infection of tuberculosis. Habits of excessive use of sweets, appetizers, and articles of difficult digestion, lay the foundation for impaired health in later years, and when the individual is overtaken with disease, the first functions to show impairment are those of digestion and assimilation.

When in the treatment of patients suffering from Tuberculosis, complicated by enfeebled digestion and assimilation, we desire to increase the amount of the food, we are very apt to overcrowd the digestive organs; which rebel, and indigestion occurs. These attacks last from a few hours to several days, during which time little or no food is taken, and we lose more than has been gained by the forced feeding. A repetition of such attacks frequently leads to catarrhal gastritis, and then the increased secretion of mucus and the fermentation of the food, lead to further changes in the mucous membrane, and sometimes in the muscular coats of the stomach, which eventually becomes chronic and extremely obstinate to treatment.

All such cases require careful individualization and regulation of

*Read before the Buncombe County Medical Society, Asheville, N. C., March 20, 1899.

diet. In some the amount of simple and very digestible food may be pushed even beyond the patient's desire for it. In others we must proceed with great care and avoid any temporary reversals and thereby loss of weight which is always an unfavorable symptom.

But in those cases where the digestion is still good, the possible impairment that may result from excessive feeding, improper food, internal medication, or alcoholic stimulation, must never be lost sight of.

Our first duty is toward the preservation of good digestion and assimilation.

Speaking now more particularly of the causes of impairment of the digestive functions, aside from those which arise from improper feeding, I will call your attention first to the improper use of alcoholic stimulants.

I am aware that I shall not meet with a consensus of opinion on this subject, for many physicians see in alcohol not only a stimulant but also a food; perhaps because they have seen some old toper who has lived a long time with his tuberculosis, or has even partially recovered from it. We have all seen such cases. Nevertheless one should not lose sight of the fact that alcohol is a stimulant and only to a limited extent a food, and that its injudicious use is known to be harmful. It is therefore not the question how well some patients may get along under abuses, but what will be the best for each one under our care.

I do not wish to be understood to be entirely adverse to the use of alcohol, but I hold that its use should be limited to those cases requiring a stimulant.

There are some cases where small doses of alcohol increase the appetite and stimulate digestion so that more food is taken and assimilated. But as soon as our purpose is accomplished the alcohol should be discontinued. We have other drugs that for continued stimulation are to be preferred to alcohol, and we can afford to reserve the latter for an emergency.

I refer more particularly to strychnine and camphor. Camphor has a special value on account of its permanency and its tendency to lower temperature. It is best given in doses of one-fifth to one-half grain dissolved in olive oil and administered hypodermically.

Among remedies which endanger the digestive functions next to the abuse of alcohol, I would place creosote and its derivatives. It is true that small doses of creosote preparations occasionally seem to stimulate digestion and to prevent fermentation, and that they may be given with benefit for a considerable length of time; but it is equally true that as we

increase the doses we soon reach a point where in many cases digestion suffers, and we are forced to discontinue the drug until the stomach recovers its tone. The first few attacks of indigestion so induced are usually of a mild type and readily yield to simple suspension of this exciting cause. Subsequent attacks from the continued use of the drug are, however, more serious and usually give rise to structural changes in the mucous membrane and muscular walls of the stomach. Atrophic gastritis is not an uncommon result of the continued use of creosote. Indeed some of the worst cases of gastric catarrh which have come under my notice were induced by creosote and their peculiar obstinacy to all treatment, including lavage and electricity, has tempted me to distinguish them as "creosote catarrh."

The difficulty of giving creosote by the stomach in large doses, supposed to directly influence the tubercular disease, led many physicians to administer it hypodermically; and those who still believe in its power to influence tubercular disease, should certainly adopt the hypodermatic method of administering it, which is entirely painless even when given in full strength. Iodine and its salts are equally injurious to the digestive tract, but fortunately have fallen into deserved disuse, although there are cases where they are valuable expectorants.

Opium and the various mineral and vegetable expectorants which form the base of the many popular cough syrups, are often accountable for at least part of the gastric disturbance in this class of patients, and it would be well to bear in mind that most expectorants are emetics if given in sufficient doses, and the greater part are distinctly irritant.

In summing up these few remarks, I desire to emphasize the fact that one of the most important points in the treatment of tuberculosis either in its incipency or in its more advanced stages, is the care of the digestive functions, and that the physician should never himself contribute to their impairment by medication through the stomach with remedies which experience has shown to be capable of doing harm to those organs.

It is a good rule to follow in the choice of remedies in tuberculosis to be governed by their effect upon nutrition: if favorable they should be continued, if not, their use should be forbidden, unless the indications for their employment are transient or extremely urgent.

REVIEW OF CURRENT LITERATURE.

EXPERIMENTAL STUDIES ON THE PREPARATION AND EFFECTS OF ANTITOXINES FOR TUBERCULOSIS.

This is the title of a report of the labors of Drs. E. L. Trudeau and E. R. Baldwin, in their laboratory at Saranac Lake, N. Y., covering the period of the last four years. The report is published in the American Journal of the Medical Sciences of December, 1898, and January, 1899. Only he who is conversant with animal experimentation and laboratory work of this character, appreciates to the full extent the enormous labor which is involved and represented in a dozen printed pages. The authors endeavored to produce an "antitoxic serum" by various methods of procedure, and report their experiments for the purpose of proving the value of their own products and of serums for Tuberculosis made by others.

Only two of their own preparations have shown enough of an influence, that they are willing to assign "possible" potency as to an antitoxic effect, and in no instance could they discover any germicidal or immunizing properties, and they appear to accept as plausible the statement of Professor Koch, that immunity to the toxic products of Tuberculosis does not necessarily imply immunity to Tuberculosis, and that a serum, which would neutralize the toxic effects of Tuberculin, may not prevent the growth of the tubercle bacillus in the tissues and its destructive action on the organs of the body.

Referring to the labors of other experimenters with dead tubercle bacilli, as showing their local irritant character and power to produce tubercles, aseptic abscesses, etc., they conclude that in view of these facts it seems hardly probable that it would be practicable to use cultures containing tubercle bacilli living or dead in sufficient doses presumably necessary to originate antagonistic substances, although Koch claimed for the production of immunity the tubercle bacillus substance to be necessary.

The only positive evidence developed by their experiments was, that one specimen of serum from an ass inoculated with non-virulent tubercle bacilli, and subsequently treated with Tuberculin, though not germicidal nor curative, showed possibly some antitoxic effect, and another specimen of serum from rabbits, (which recovered after inoculation with non-virulent, and with virulent tubercle bacilli), the authors say, possibly conferred some protection in Tuberculin poisoning, and possibly prolonged the life of treated Guinea pigs.

Such results were also obtained in the Laboratory of the writer with the imported serum of Maragliano, and with serum obtained from goats

having been treated with large doses of Tuberculin made entirely after the Maragliano method. Half a cubic centimeter of either of these serums protected Guinea pigs against fatal doses of Tuberculin, and a few of the Guinea pigs treated with these serums outlived their controls.

In the light of this evidence it may be well to consider again whether it is at all desirable to obtain an antitoxic serum even if one much more effective than Maragliano's preparation could be produced, and to again call attention to the difference in the existing condition, between the object to be obtained, when we treat diphtheria with an antitoxine, and when we propose to apply a like method to the treatment of Tuberculosis.

In diphtheria we have an acute infectious disease, in which immunity to a degree so that the patient can recover occurs quickly in the course of a week or ten days, this immunity results from toxins which being absorbed into the blood cause the constitutional symptoms during the existence of the disease; and which during the same time bring about the change from susceptibility to successful resistance, which we call immunity.

The degree of intoxication and of constitutional reaction to the absorbed bacterial poisons is, however, not alike in all infectious diseases and thus it happens that under the acute conditions which obtain in diphtheria the patient may perish, before he can attain his immunity in the natural course of the disease, though perhaps more frequently death occurs as a result of complications. Under such circumstances of excessive intoxication, an antitoxine, that is to say a serum having antagonistic properties to the toxins, may be highly beneficial and become a life-saving agent by modifying the severity of the intoxication which is then in excess of what is required to bring about the desired immunity.

Antitoxic serums, whether for diphtheria, tetanus, or tuberculosis, have no germicidal properties and all that can be expected of them is that they will modify the excessive effects of toxins, which form and are absorbed into the blood in the infected organism, so as to prevent a fatal result before the natural cure can be accomplished. That such a result is obtainable, in diphtheria at least, appears now well established.

If now, patients suffering from Tuberculosis did die from the toxins produced by tubercle bacilli, then an antitoxic serum would be desirable to avert such a result. Such is, however, not the case, unless perhaps in the acute miliary form, and if ever we obtain an effective antitoxic serum from immunization of animals, it is in this form where it

would be indicated, here it could at least be hoped to tide the patient over the acute symptoms in the hope that the large amount of toxins absorbed would establish immunity at a time when the structural changes would still admit of repair.

In the chronic and local forms of Tuberculosis, the amount of toxins produced by the tubercle bacilli at no time threaten the life of the patient, on the contrary the patient acquires tolerance, death is not produced by them at all, but by the subsequent changes which result from degeneration and destructive processes of tubercles and the tissues in which they are formed. In other words, tubercular patients die as a rule of phthisis, under symptoms from absorption of products of disintegrating tuberculous tissues, and incidental complications.

The toxins from tubercle bacilli in chronic and local tuberculosis are only small in amount, and as a rule they are not formed and absorbed in sufficient quantity to cause the peculiar reaction of the organism which we call immunity, and for this reason complete recovery does not usually follow an attack. A degree of immunity may, however, be induced sufficient to cause temporary arrest of the local process, which when lost makes renewed activity possible.

The labors of Drs. Trudeau and Baldwin show clearly that we have little to expect from blood serum of animals immunized against tuberculosis, even as an antitoxic, and their failures point all the more to the adoption of the direct method, that is the immunization of the patient himself, which has given satisfactory results not only in the animal experiments but in the actual treatment of tubercular patients even with the first product "the old Tuberculin" of Professor Koch.

CAMPBOR INJECTIONS IN PULMONARY TUBERCULOSIS.

Dr. B. Alexander, in the *Berliner Klinische Wochenschrift*, No. 48, 1898, recommends injections of camphorated oil as a most valuable aid in the treatment of all stages, comparing its action in phthisis to that of digitalis in heart disease. Camphor according to his experience is a true muscle tonic acting on the terminals of motor nerves. No other remedy acts so favorably upon the appetite in phthisis, and in atonic conditions of the stomach it is most valuable. It also reduces the temperature in phthisis even in quite small doses, and has a favorable influence upon suppuration. The sputum is thus reduced in quantity, and by reducing the reflex irritability through its hypnotic and sedative effect, the cough is diminished. In cases with fever, Alexander injects daily

0.1 c. c. to 0.2 c. c. camphorated oil of the strength of one part to ten, for periods of four to six weeks, then he intermits for one or several weeks and resumes the treatment as before. When the patient has become free from fever he goes to larger doses, of 0.3 c. c. to 0.5 c. c., now, however, only for short periods of a week or two, when an intermission of a week is again observed. As the treatment is continued in the afebrile period the intermission becomes more frequent, four daily injections being followed by four days of rest; and as the general improvement becomes more marked the intervals between the injections are still longer.

THE SOURCE OF INFECTION IN TUBERCULOSIS.

In the *Berliner Klinische Wochenschrift* of January 9, appears an article on the prophylaxis of tuberculosis by Professor B. Fraenkel in which the author maintains that the heretofore accepted theory of infection with dried and powdered sputum through inhalation of such particles as dust, based upon Professor Cornet's study of the subject (1) is no longer sufficient. He cites the recent contributions and experiments of Fluegge, showing a heretofore overlooked mode by which pathogenic germs enter the air, being minute fluid particles which are projected from the mouth of persons suffering from phthisis during the act of speaking, hawking and coughing, which Fluegge suggests may have been the source of tubercle bacilli, found by Cornet in the dust of rooms occupied by consumptives. For proof of the danger from this source Fraenkel quotes the experiment of Huebner (2), who used the non-pathogenic bacillus *Prodigiosus* suspended in water, the experimenter rinsing and gargling his mouth with this fluid. Upon agar plates set before him, and then counting with a loud voice up to 375, one hundred and nineteen colonies of the germs developed; whispering up to 360 produced 17, and speaking the numbers in an ordinary tone up to 550 produced 41 colonies. Removing of the agar plates to 20 inches distance from the mouth still gave rise to the development of colonies.

The experiments of Schaeffer (3) with lepers are also given. Lepers having specific ulcerations in the mouth and throat and speaking for 10

(1) Cornet; *Die Verbreitung der Tuberculose*, *Zeitschrift fuer Hygiene*, Vol. V.

(2) Huebner; *Zeitschrift fuer Hygiene*, Vol. 28, p. 348.

(3) *Archives for Dermatology and Syphilis*.

minutes, the projected particles were intercepted upon glass slides when it was demonstrated by staining and microscopical examinations that thousands (as high as 180,000) of lepra bacilli had been thrown out in this manner.

Latschenko (1) obtained similar results by passing slow air currents through not very tenacious tubercular sputum, and intercepting fluid particles at a distance of three feet. Causing phthisical patients to cough through a small opening into a glass chamber tubercle bacilli were found in the interior. Slides exposed at a distance of three feet from the mouth of consumptives for an hour gave but few and as a rule no positive results; but a rich harvest of tubercle bacilli was obtained, when the experiment was made with such patients at the time of severe coughing which is usual on first rising in the morning.

The practical deductions made by Fraenkel are, that in the light of these results, we need to reconsider our present views as to the mode of infection in tuberculosis, and for the implied real source of danger he recommends the interception of the infectious material by the constant wearing of a mask by consumptives, the mask covering the mouth only, leaving the nose free for unhindered respiration.

THE TREATMENT OF LUPUS WITH ELECTRIC LIGHT.

At the Congress for Tuberculosis which met in Paris last July, Dr. Bang gave an account of Finsen's method of treating Lupus. The method depends upon the germicidal effect of light, and the apparatus used is that devised by Bang. It consists of an electric arc light and a glass lens containing an ammoniacal copper sulphate solution by which the effective violet rays are isolated and concentrated; the violet and ultra-violet rays being 300 times stronger than the red rays.

The area affected by Lupus is compressed and made bloodless by a special apparatus consisting of two quartz crystal plates with a layer of cooling water between them, thus affording better penetration of the light. Each treatment lasts an hour, and the application is painless. Six to eight hours later an inflammatory reaction takes place in the part operated upon, which is attended by a tendency to cicatrization. Unfortunately the treatment requires a long time, daily applications for a period of four to five months being required. Finsen claims 35 cures

(1) Deutsche Med. Wochenschrift, 1897, No. 42.

within the last two years in his institution in Copenhagen, all other cases undertaken by him progressing favorably, and no relapses having as yet been observed.

HEROIN FOR COUGH IN PHTHISIS.

There are always cases of Phthisis, in which the cough is excessive. When due to irritation, and not requisite for expectoration, severe and continuous coughing is harmful, tiring the patient unnecessarily, and it frequently causes vomiting and loss of sleep. In some instances such unavailing cough can be suppressed by the patient resisting the impulse, in others the patient is unable to do this, and the more he coughs the greater becomes the local congestion and irritation, and the paroxysms continue until they cease from "sheer exhaustion." It is all very well for writers to insist that opiates do harm, and that their administration should be avoided, but when we meet such cases in practice, we frequently find ourselves compelled to choose the least of two evils, and nothing else availing, we give opiates.

Codeine, being less objectionable than morphine, has had a large place as a remedy for such cases, but small doses soon lose their effect, and disagreeable after effects become apparent as the doses are necessarily increased.

The report on the use of Heroin by Dr. Georg Strube (1) appeared to justify a trial of this remedy, especially as it is said to have no poisonous properties, and its employment for some time past in the Winyah Sanitarium has been with increasing confidence and satisfaction. So far Heroin has accomplished all that was expected in the class of cases indicated above, and while controlling cough better than Codeine and in much smaller doses, it secured quiet and refreshing sleep more uniformly when given at bed-time.

No incidental effects of a disagreeable or undesirable character have as yet been observed. Should a larger experience confirm the present favorable opinion, there can be no doubt that it will deserve preference over and supersede the use of Codeine.

INTENDING CONTRIBUTORS for succeeding numbers are requested to contribute articles on the following subjects:

1. Can the early stages of Pulmonary Tuberculosis be diagnosed with reasonable certainty without diagnostic injections of Tuberculin?
2. Are alcoholic stimulants advantageous, or essential in the treatment of Phthisis?

SUPPLEMENT TO THE JOURNAL OF TUBERCULOSIS.

In this part the whole subject of Pulmonary Tuberculosis will be covered by a continued series of articles written by Dr. Karl von Ruck. Articles already in print will be revised, and republished, and others will be written new, appearing in the following order :

Article I.—The cause of Tuberculosis, and the conditions which predispose to its acquirement. Article II.—The Prevention of Tuberculosis. Article III.—The Clinical Course of Pulmonary Tuberculosis, with reference to its pathology and complications. Article IV.—The Diagnosis of Pulmonary Tuberculosis. Article V.—The Prognosis of Pulmonary Tuberculosis. Article VI.—The Treatment of Tuberculosis, dietetic, hygienic and symptomatic. Article VII.—The Climatic Treatment. Article VIII.—The Specific Treatment. Article IX.—Laryngeal Tuberculosis, its diagnosis and treatment. Article X.—Institutions for the Treatment of Pulmonary Tuberculosis.

I.

THE CAUSE OF TUBERCULOSIS AND THE CONDITIONS WHICH PREDISPOSE TO ITS ACQUIREMENT.

The communicability of Phthisis has been recognized for centuries, and at various periods more or less systematic measures were advocated, or carried out toward its prevention.

More closely observed instances of communication of the disease from person to person occurred in years more immediately preceding the advent of biological and bacteriological research, and the successful transplantation of human tubercles into lower animals with reproduction of the disease was an established fact 40 years prior to the discovery by Professor R. Koch of the specific germ in 1882.

The labors of Pasteur, more than those of any other, and the thereby increased interest in the subject of pathogenic micro-organisms, the improved technique in their isolation and cultivation, especially the introduction of the plate culture by Professor Koch, the improvements in the microscope, and the accumulating experience of an increasing number of able experimenters, all helped to pave the way to the discovery of the bacillus of Tuberculosis, as has since been the case with the isolation and recognition of other disease germs.

The degree of advancement in bacteriological research in 1882 was such, that the discovery of Professor Koch was not altogether unexpected, and it would undoubtedly have come at the hands of some one else before this time. The admiration of Koch's work was particularly great because of its completeness, and of the unassailable

proofs with which he demonstrated his claims at their first announcement.

His perfect demonstrations and logical conclusions compelled quick recognition and acceptance by the scientific world, and most of his critics, of which there were of course some, were soon silenced.

Slight as it was, the opposition to Koch's discovery nevertheless has shown some effect, especially upon a few of those not trained in the details of this particular line of research, and to this day there are still members of the profession who re-echo the futile objections and arguments, which were brought forward and were effectually refuted more than sixteen years ago, without making, or perhaps ever having made, the slightest effort to gain personal knowledge for a basis to their assertions.

Were it not for harm done by such opponents in their practice, and by opposing and retarding essential measures for prevention, we could well afford to ignore them, since at least some of them evidently do not wish to be convinced but delight in being on the opposite side, even at the risk of defending error; because they do not wish to acknowledge the value and advantage of scientific research, in which, by their inability, they can have no share.

It is, therefore, useless to re-state the voluminous and conclusive evidence, or make comments in support of it for the benefit of such opponents, if they have failed to be convinced by the proof already furnished, I cannot hope to do so, by reviewing them in the space at my disposal, and, if their unbelief depends upon ignorance, only they can change it.

After the relation of the bacillus of Koch to Tuberculosis was demonstrated, the almost uniform presence of the germ in the sputum of consumptives and in secretions from open tubercular surfaces, caused such excretions and discharges to be considered as the only source through which infection takes place.

Cornet (1), through his examination of the dust from rooms occupied by tubercular patients, demonstrated the presence or absence of the infecting germs, according to the degree of care used in regard to the collection and disinfection of the sputum of their occupants.

Many additional observations confirming the work of Cornet have been made since; and the experimental infection of animals with such

(1) Cornet; Die Verbreitung der Tuberculose, Zeitschr. fuer Hyg., Vol. V, 1888.

dust proved its danger while it also showed, that tubercle bacilli may live, and retain their virulency outside of the body for months and even years.

More recent investigations, especially the experiments cited by Fraenkel, (1) appear to prove that minute particles of moisture, which escape the mouth in ordinary speaking, but more particularly upon hawking and severe coughing, may in consumptives be the carriers of tubercle bacilli, and thus contribute to the spreading the germs through the air; however this may be, it is the expectoration, that is, the discharge from tuberculous lesions in the upper air passages and in the lungs, no matter how expelled, which is rightly accepted as the most prolific source of the bacillus by which the human subject spreads the disease; but we must not forget lupus, and other tubercular ulcerations of the skin and mucons membranes, nor the pus from tubercular abscesses in connection with suppurating glands tubercular disease of the bone and joints; furthermore, we must think of the discharges from tubercular affections of the ear, nose and the eye, the intestines, and rectum, and of the entire genito-urinary tract.

Although the number of tubercle bacilli discharged and liberated from all other sources admits of no comparison with those contained in tuberculous expectoration, we should now more particularly recognize these minor sources also, because the chief source is universally acknowledged, while these less frequent and less conspicuous sources are often considered unimportant, or are entirely ignored.

Since the discovery of Tuberculin and of its reliability for diagnostic purposes, another important source, through which tubercle bacilli may reach us, has been most effectually demonstrated to exist in domestic animals, especially cattle, which appear to suffer from Tuberculosis to an alarming extent, perhaps 10 to 20 per cent. being a low estimate of the number of animals giving evidence of infection by the Tuberculin test, which is almost unfailing, in revealing the presence of Tuberculosis in animals and equally so in the human subject, providing the procedure is carried out with due care, and the specimen of Tuberculin is of known standard quality.

But even with simple inspection rapidly carried out in the large abbatoir of Leipsic, Germany, Rieck found of 67,077 cattle butchered in the three years of 1888 to 1891, 13,688 to be tubercular; therefore 20.4-10 per cent.; and these figures by no means present the entire truth, for to them must be added an unknown number, representing animals

which though passed as "healthy," have had slighter degrees of tubercular deposits, which escaped the recognition of the inspectors.

That this is the case, is shown by the constantly increasing percentage of Tuberculosis in cattle found in various cities in Germany in proportion as the number of competent inspectors is increased, and as their work is more painstakingly performed.

In this country the Bureau of Animal Industry (1) reported 20 per cent. of positive results in 125 animals tested with Tuberculin in the District of Columbia; and various other series of tests in different states and localities fluctuate between 15 and 40 per cent.

The presence of tubercle bacilli in the milk of tuberculous cows, although difficult to demonstrate, and therefore rarely observed, is, nevertheless, liable to occur in this valuable food product, which, in this country, is generally used in the raw state.

Klenke, over fifty years ago, and subsequently Gerlach, Klebs and others, have shown the relation of the use of milk from cows suffering with "Pearl Disease" to the occurrence of tuberculosis in man; and since the discovery of the specific germ its presence in milk has been repeatedly demonstrated.

In twenty specimens of milk examined several years ago by the Bureau of Animal Industry at Washington, one contained a sufficient number of tubercle bacilli, that a cubic centimeter of the milk caused successful infection of the Guinea pig; and numerous instances of successful infection, of animals with milk from tubercular cows, appear in the report of Dr. H. C. Ernst to the Massachusetts Society for the Promotion of Agriculture (2).

This report contains also much evidence of the transmission of Tuberculosis from animals to man through the medium of milk, and I have, myself, observed several cases of human tuberculosis, in which there was very good reason to presume such transmission, one of which appeared to me almost conclusive.*

(1) Report of 1893 and 1894.

(2) Infectiousness of Milk, Boston, 1895.

* Mr. M., age 33, a strong, robust farmer, 6 feet tall, weighing 180 lbs., was taken ill, and attended by his family physician for about six weeks, for what was supposed to be Typhoid fever; growing continually worse when convalescence was looked for, I was called in consultation, and the diagnosis of acute, miliary tuberculosis was established after several days, when a small amount of sputum was found to contain tubercle bacilli. The autopsy showed the usual dissemination of the tubercular process; but no old focus of tuber-

It is, however, not only the milk, but the tissues of tuberculous cattle and their excrements which carry with them dangers of spreading the disease to man, as well as to other animals.

The seat of tubercular disease in cattle was shown by ordinary inspection in the larger cities in Germany in the year 1888-'89 (1) to be as follows:

	PER CENT.	The percentage of tubercular disease of particular organs was, for—	PER CENT.
One organ only was involved in . . .	50 to 60		
Only one of the large cavities in . . .	13 to 17		
Several large cavities in	15 to 20	The lungs	75
The muscular parts in	05	Pleura (parietal)	55
General tuberculosis was present		Peritoneum	48
in	10	Pleura (costal)	47

cular disease was found, either in the chest or abdomen, which, only, were permitted to be examined.

The family and personal history were free from anything justifiable to construe a hereditary or acquired predisposition, and the source and mode of infection remained, for the time, obscure.

A few days after Mr. M.'s death I was called to see his nearly one year old child, on account of fever and diarrhœa, which yielded to change in diet and general measures, but the child did not recover its former good health; gradually symptoms of meningitis developed and the child died. No post-mortem was permitted, I had, however, no doubt of the tubercular character of the meningitis. Infection from the father was not a probable theory, the child having been removed from the house at an early period of his illness, the mother devoting herself to the care of her husband, while the grandmother took charge of the infant and weaned it.

The milk which the child received came from a favorite, fine bred Jersey animal, and no other had been used up to the time when I changed the diet on account of the diarrhœal attack.

Inquiring more particularly into the possibility of milk infection, I found that the father had drunk largely of this cow's milk, taking a pint and sometimes a quart twice a day, warm, at the time of milking, and up to the time of his illness; and that this same cow's milk was given him exclusively during his entire illness. There was nothing suspicious about the cow, except that she was not fat; but I noticed that one of the teats was shrunken, and obtained information that it gave little milk, and that several months before, the milk was occasionally bloody from this teat.

Examining more closely, I found a hard, irregular lump on the same side of the udder, which was attributed to an injury; but how the injury occurred was not known. Without entering into further details the conclusive proof was eventually obtained when several months later the cow was killed, and extensive tuberculosis was easily recognized in the lungs and peritoneal cavity. The lump in the udder contained a caseous center which, on examination, showed plenty of well stained tubercle bacilli.

(1) Voges *Der Kampf gegen die Tuberculose des Rindviehs*, Jena, 1897.

PER CENT.		PER CENT.	
Glands, (bronchial and diaphragm)	29	Bones.....	0.4
Liver.....	28	Intestines.....	0.3
Spleen.....	19	All organs of chest and abdomen..	0.2
Uterus.....	10	Treacheal glands.....	0.2
Glands (lumbar).....	5	Diaphragm.....	0.2
Glands (pharynx).....	4	Stomach.....	0.16
Treachea.....	3	Muscles.....	0.10
Udder.....	1	Glands, (inguinal and of the knee)	0.06
Ovaries.....	1	Brain.....	0.04
Intestinal glands.....	1	Spinal cord.....	0.03
Glands, (chest and abdominal cavity)	0.9	Tongue.....	0.01
Heart.....	0.9	Thymus glands.....	0.01
Kidneys.....	0.7	Vagina.....	0.01
		Testicles.....	0.01

Although the muscular tissues appear to be seldom the seat of Tuberculosis, yet the glandular organs and lymphatics are commonly affected, and tubercular disease in lymph glands and vessels may be widely distributed in minute localizations which would escape ordinary inspection.

We are, therefore, also liable to infection by eating raw or rare beef, which may contain tubercles in its lymphatics; and were it not for the fact that livers are usually well cooked before they are eaten, the danger of infection from the eating of these glands would be much greater.

Neither is there any security in the belief that the acid secretion of the stomach destroys the bacillus; the slight percentage of acid present has no material influence upon the life of the germs. Indeed, tubercle bacilli can be grown upon media which contain almost as much acid as does the gastric juice, and we can no longer console ourselves with this theory.

Finally, tubercle bacilli are often present in the faecal matter of cattle; and it is probable that through this source the germs are frequently communicated to other animals, while they may also reach the human being with dust.

Horses, mules, goats and dogs are less frequently subjects of tuberculosis, perhaps in the order named, but every domestic, warm-blooded animal is liable, the relative frequency being only a matter of degree; swine, cats, mice, and rats are especially liable to the disease. I have myself, observed several instances of tuberculosis in such animals, and it seems probable that cats are infected through the flesh of tubercular mice and rats.

The secretions and excretions from the seat of tubercular disease of man and animals contain the virulent bacilli, and unless especially intercepted, destroyed, or disinfected, before they become dry, and pul-

verized, they are liable to be carried with currents of air, and to remain suspended in the air, so that they may be inhaled, or may be deposited upon our food.

Milk and flesh from tubercular animals may also contain virulent germs unless sterilized by boiling.

A single particle of pulverized expectoration, small enough to float in the air as dust, or a tubercular nodule in a lymphatic vessel or gland large enough to be appreciable to touch or sight, may contain many thousands of germs, their size being from 1-8000 to 1-12000 part of an inch in length and about one-eighth of this in breadth.

Such being the case, in the absence of effective preventive measures, we are not surprised to find that Tuberculosis in one form or another, is the most prevalent of all diseases, and that with increase and density of population a corresponding increase in frequency of the disease is observed.

There is little doubt that numerous living germs are inhaled or taken in with food by every person at one time or another, while living in communities where tuberculosis exists among their inhabitants, or among their domestic animals.

Having thus shown that the presence and spread of the tubercle bacillus outside of the living body is almost without limit, we may consider it fortunate that without a suitable, moist papulum for food and a constant temperature, between 90 and 105, the bacilli cannot easily grow and multiply; indeed even the limits of the temperatures indicated retard and often entirely arrest the growth of an artificial culture. Favorable conditions for their growth we find, therefore, only within the bodies of warm blooded animals. Tubercle bacilli having been exposed to unfavorable temperatures in an artificial culture are injured very easily and a severe chilling or over-heating arrests their further growth often for weeks. Temperature influences to degrees lower than the temperature of the blood must operate on nearly if not all tubercle bacilli before they find their way into other living bodies, after having been discharged with sputum or otherwise, and sunlight has been found to destroy them, conditions which no doubt restrict successful infection perhaps much more than we now believe and which at least must so influence the germs, that their natural slow growth is more retarded in the period of first invasion, during which the defensive properties of the living organism have a better and a longer chance to become effective.

In perfectly healthy and strong individuals the natural defences

are, as a rule, sufficient to prevent the localization of the germs and their invasion of tissues with the formation of tubercles.

The antagonistic influence of living tissues to germ invasion has been a subject of great interest and of diligent study especially by Metchnikoff and Buchner. The former showed that the wandering blood cells, which he called phagocytes, are capable of taking up within their bodies, micro-organisms and other foreign substances, and that the former frequently perish within the cell; but it has also been found, that the cell may perish, and the germs survive instead.

Buchner has more particularly demonstrated the germicidal properties of the blood exclusive of its cellular elements, and found that it can destroy disease germs, while Landois had before him demonstrated its globucidal effect, finding that the serum obtained from one animal may act destructively upon the corpuscles of the blood from another.

Heating of blood serum to 50° C. destroys both germicidal and globucidal properties, without inducing coagulation or other recognizable alteration.

The germicidal properties of the blood serum have been confirmed by many other experimentors and they have more recently shown that this property is not only confined to the serum, but also to other tissues of the living organism, varying in degree in different tissues of the same animal, differing further in different species of animals, and again in individuals of the same species.

The further study of this subject has led to the still more important and practical knowledge, namely: that by the gradual introduction into the blood of the toxins from certain pathogenic micro-organisms, immunity can be established, as that the growth and multiplication of these germs can longer occur, or continue, in the animal or person so treated.

The contraction of infectious diseases appears to be governed by the degree of resistance or of immunity present at the time in the individual, and the recovery from them is induced by the development of immunity during their continuance. Whenever we witness the establishment of convalescence and of final recovery from an infectious or contagious disease, we now know, that while these peculiar properties of the tissues were inadequate to prevent it, they have become so augmented that the poisons of the particular bacteria cause no more disturbance, and that under this changed condition the bacteria themselves disappear, and that without such change occurring, the patient must inevitably die.

This holds good in all infectious diseases, although the length of

time for which the acquired immunity lasts is variable, both as to the individual, and as to the particular disease.

In some diseases like diphtheria it appears to be very short, in others, like typhoid fever, the protection may last for years or more frequently for the rest of the person's life.

Few persons appear to have a sufficient degree of natural resistance to absolutely protect them against infection with tubercle bacilli, but practical observation has certainly shown that in this respect there is a great difference in different persons; after the disease is established it is still an open question, whether or not immunity sufficient to affect a recovery may occur as we see it in the more acute infectious diseases. However this may be, this is not a matter for further consideration in connection with the etiology of the disease, and for present purposes it suffices to recognize that some persons appear to be more predisposed than others, and to point out the conditions which appear to favor or to hinder infection with the specific germ.

In the preceding general considerations we accepted the tubercle bacillus as the primary cause, but in addition we must now examine the predisposing influences, hereditary and acquired, which favor the infection of individuals.

As to the former, there is no longer any doubt that the tubercle bacillus can be directly transmitted from the tubercular mother to the child.

The few well authenticated cases in which tubercles were found in still-born children, or in which the tubercular affection caused the infant's death, only a few days or weeks after birth, and, therefore, before post-natal infection of the child with formation of tubercles could have occurred, show this conclusively; but the infrequency of such observations also shows that such direct transmission must be comparatively rare.

For its occurrence, unless the germs may be transmitted by the father also, the germicidal properties of the maternal blood must have been in abeyance or greatly reduced, and virulent germs must have passed through the placental vessels to the foetal circulation.

While this is possible, it implies, as a rule, a far advanced state of the disease on the part of the mother, in which the menstrual function is usually suspended, or if conception still occurs the gestation is likely to be interrupted by reason of the general cachexia, or the mother dies of her disease before birth of the child.

To the possible question as to whether minute, tubercular localiza-

tion may not have occurred in the child in utero, not sufficiently advanced at birth to cause symptoms, which may have remained latent in the lymph channels and vessels until a later period of life, we are not prepared to give an answer.

Such a possibility must be admitted, but its occurrence can only be demonstrated by most painstaking examination of the bodies of infants born of tubercular mothers, who die in the first few months of their lives.

Without such direct transmission we recognize an hereditary predisposition, that is the transmission to the offspring of more vulnerable tissues deficient in their germicidal and defensive properties, and also of certain other peculiarities in general structure, especially of the lymphatic system and of the respiratory organs, by which the localization of the germs is favored.

Past and present experiences have abundantly demonstrated that parents transmit to their children not only physical resemblances and peculiarities, but also moral and mental traits, and even special tendencies to certain diseases, which are variously modified by the blending or predominance of the characteristics of the parents and of more remote ancestors.

We are also familiar with the direful results of consanguinous marriages, as well as the good results of the infusion of new and different blood into communities and states. If predisposition to disease is transmitted at all, we can, with all propriety, look for it in those, whose more or less remote ancestors have physically degenerated, or whose normal equilibrium of health had been materially lowered at the time when their offspring could have been subjected to its influence.

Thus consumption, syphilis, malignant disease, severe nervous affections, etc., etc., are frequently found to have been present in the parents or grandparents of our tubercular patients.

An analysis of the histories of 501 cases of pulmonary tuberculosis, with a view of determining the influence of hereditary and acquired predisposition, was made and published by me in 1890 (1); more recently I examined the histories of 499 additional cases with the same object, and also to obtain a larger number from which to form conclusions. In these 1,000 cases I find that a tubercular family history was present 388 times.

(1) The Prognosis in Pulmonary Tuberculosis. Medical News, Sept. 13, 1890.

In 217 histories, in which tubercular disease of ancestors was absent, it was stated that the health of one or both parents had been seriously impaired for considerable periods prior to and during the time it is liable to influence the child. One or several of the grandparents had also been long sufferers from chronic disease.

The affections claimed to have been present in the parents were chronic diarrhoea, chronic dyspepsia, cancer, diseases of bones, severe disease of the genito-urinary organs, chronic bronchitis, asthma, alcoholism, chronic disease of the liver, dropsy, paralysis, locomotor ataxia, nervous prostration, epilepsy, insanity and general poor health.

In 149 histories, the patient, although showing no hereditary predisposition in the sense that there was tuberculosis or other severe disease in their ancestors, was found to be the sixth or later child, the births having, as a rule, occurred in rapid succession, and lactation having been almost continuous for several years together.

Fifty-six brothers or sisters of these patients were then suffering from, or had already died of tuberculosis, 43 were younger, 4 were twins and only 9 older, a significant fact which Brehmer so much insisted upon, namely, that the resistance of the child decreases as the health and vitality of the mother become exhausted by frequent child-bearing and lactation.

In 22 other histories nothing could be brought out indicating hereditary predisposition, except that the patients were twins; all these patients stated to have been "weakly" from childhood, and in six instances the other twin also had consumption, or had already died of it.

The fact that these 1,000 cases include 25 twins is interesting in confirming the common observation that children of multiple birth are usually not as strong and vigorous as others.

Adding the 428 cases in which predisposition can not be directly attributed to a tubercular family history, to the 388 cases in which tuberculosis of ancestors was shown to have been at least one of the factors, we have 816 cases out of 1,000 whom we can justly claim to be legatees of a weak constitution by reason of their ancestry, and who, on this account, had less than an average degree of resisting power to tubercular infection—and probably to the acquirement of other diseases also.

It is surprising to note the array of facts, which bear testimony to hereditary predisposition in the acquirement of tuberculosis, and it would be interesting to study more fully the histories of a large number

of healthy adults in order to bring out the relative frequency of predisposition by reason of heredity.

Such a study was undertaken by me a number of years ago, but had not been entirely completed when my data and records were destroyed by fire.

The study had then been extended to nearly two hundred inquiries, and as well as I can now recollect, it showed that hereditary predisposition in the sense of a tubercular family history was present in a fraction of over 18 per cent., while hereditary predisposition due to other causes was shown in about 12 per cent., making a total of 30 per cent.

The persons whose histories were examined were all adults, between the ages of 35 and 60, and, therefore, beyond the period of life where hereditary influences may be expected to strongly assert themselves in the future acquirement of tuberculosis.

The fact that only 30 per cent. of these individuals could be claimed as predisposed while in the 1,000 cases who actually suffered from the disease, 81.6-10 per cent. showed such a predisposition, seems to confirm the belief that such predisposed persons acquire the disease more frequently.

If we thus look upon hereditary influences in the acquirement of tuberculosis in the sense spoken of, the subject becomes a very wide one for consideration, and impossible to follow out in detail, involving, as it does, the recognition of the deleterious causes and their effects, to which the human race has been subject for many past generations, and which must have again been modified in endless variations and degrees by opposite causes and effects of a conservative nature, under which resistance and non-resistance to disease were respectively in ascendancy or decline.

To me it would seem quite probable that under more primitive conditions of life, there was a time when the resistance to infection was complete, or, at any rate, much greater than now.

The law of survival of the fittest at that time was undoubtedly more effectual in its operations; the occasional weaklings had little chance to survive to a period of life where they would produce progeny; the unhygienic influences of modern environments, such as living in large cities and communities, unhealthy occupations, and the subsequent and ever-increasing struggle for maintenance were then not operative as now for decreasing the natural resistance, while the painstaking rearing of delicate children and the artificial care of weaklings as we know it and practice it now, was then unknown.

This view is corroborated by the fact that domesticated animals are liable to some infectious diseases, from which the wild animals, even of the same class or species, are almost or entirely exempt.

This is particularly true of tuberculosis, and it is also true with man still remote to and unaffected by our civilization.

In this connection we may, however, also think of the probability that the specific germ must not necessarily have been pathogenic in all past time; although belonging to a low class of plant life, it has had its evolution and adaptation to changing environments; and though the tubercle bacillus cannot now grow and multiply to any appreciable degree except at a very narrow range of temperature, corresponding to that of warm-blooded animals, there may have been a time when at temperatures now most favorable to its growth, it could not have existed.

The tuberculosis of birds which have a higher temperature than man, cannot be directly engrafted upon animals, nor can we engraft the human form upon birds, without gradual adaptation; and yet there is no apparent difference in the germs themselves. In accordance with the laws of evolution and of natural selection the originally benign germ, living and multiplying only at temperatures above that of animals, may have adapted itself gradually, so that it is now restricted to a lower temperature. There is also good reason to believe that transition forms occur, which bridge over the difference between the mammalian and avian varieties, and the like may be true of other pathogenic micro-organisms.

Summarizing thus our views on the subject of predisposition, we must conclude under the law of heredity, that some ancestors may transmit a greater liability to this disease, than do others, and daily observations confirm that anything which interferes with the full harmonious functions of the parental and more particularly the maternal organism to such a degree that the nutritive processes and, therefore, the strength and vitality of the individual are materially diminished, may eventually become manifest in the offspring as a permanent change, in the particular organs involved; the more so, the more constantly these influences have been operative upon past generations.

If we admit such hereditary predisposition as a factor favorable to the acquirement of tuberculosis, we must also admit that the predisposition may be acquired, of which we have abundant evidence, both in man and animals.

As to the latter, I have already cited the fact that domestication

predisposes animals to infectious diseases, and particularly to tuberculosis.

The social evolution and aggregation of man as they occur in our present civilization, had, no doubt, a similar influence by increasing the opportunity for numerous infections from one individual and by lessening the invigorating influences derived from a continuous out-of-door life.

We thus find that apart from actual disease, past or present, man is unfavorably influenced in the acquirement of tuberculosis by bad climate and environment, indoor life, exposure, sedentary and unhealthy, and especially dusty occupations, abnormal moral and mental states, and by many other conditions capable of lowering the ideal standard of perfect health.

No doubt in many of the cases in which hereditary predisposition has been assumed to have contributed to the more ready acquirement of tuberculosis, the patients have, by their own mode of life and environment, contributed further in lowering their resistance; and in some of the hereditarily predisposed individuals who escaped, we may assume that their mode of life, environments and the general conditions under which they lived were favorable so that their individual resistance was increased.

In 184 out of one thousand tubercular patients nothing could be elicited to justify the assumption of hereditary predisposition; most of these patients showed an excellent ancestry, both in vigor and longevity, but their personal histories were, as a rule, not good.

In 128 of these cases either severe and protracted illness or severe injuries, from which the patient had never recovered his former strength and vigor, preceded the advent of tuberculosis, or prolonged mental strain and worry, neurasthenia, unhygienic dwellings, bad climatic conditions, night labor with dissipation during day hours, close confinement, acquired syphilis, abuse of alcohol, privations and exposure, sometimes singly, and at other times variously combined, formed the personal histories. In 56 cases only, was the personal history equally faultless with the family history; and of those we may conclude that the infection was either unusually virulent, the exposure frequently repeated, or that the especially favoring influence escaped our notice.

Perhaps we should here also notice the nervous theory of origin of pulmonary tuberculosis, which received much attention prior to the discovery of the tubercle bacillus, and which is still diligently advanced by

Dr. Thomas J. Mays (1), who, within the last few years has written much on the subject, with especial emphasis upon impairment of the pneumo-gastric nerves as a cause of consumption.

While I could not entertain the theory that lesions of the pneumo-gastrics, or of any other part of the nervous system can be the actual cause of tubercular disease in the lungs or elsewhere, Dr. Mays and his predecessors have undoubtedly shown by much interesting evidence that such lesions, predispose to the occurrence of the disease in the sense that I have elsewhere stated, and acknowledged.

All the facts cited cannot possibly do more than to show that lesions of the nervous system, as of the digestive and blood-making apparatus, interfere with local or general nutrition or both; that pathological changes in the pneumo-gastric and recurrent nerves may more directly influence the nutrition of the breathing apparatus, should need no special mention.

The question of KNOWN EXPOSURE to direct infection has received much scrutiny by me, and in my long experience with now over 2,800 cases examined, I have been able to find very few instances only, where the relation of cause and effect appeared undoubted, and in which such exposure was followed by pulmonary tuberculosis IN INDIVIDUALS NOT OTHERWISE PREDISPOSED.

I do not make this statement with the object of conveying a belief, that only the predisposed can be infected, for I have just stated that 56 of the 1,000 cases showed a perfect history, both of their families and of their own lives; what I want to convey is simply, that infection is comparatively rare in persons who are free from all predisposing influences in the sense heretofore shown.

In the institutions which I have now conducted for over 10 years, not one single case of infection of either predisposed or not predisposed persons has come to my knowledge; and while the matter of prevention has been an object of continuous solicitude and care, yet it is a remarkable fact, that the personelle of the Institution, as well as my own family coming most intimately in contact with tubercular patients for year after year, have all escaped without exception.

This experience should be a great encouragement for preventive efforts, while it may also serve to allay the undue fear of some especially timid persons, or of those who would banish the consumptive from intercourse with society at large.

(1) Toxicosis of the nervous system as a cause for consumption. Journal of Nervous and Mental Diseases, November, 1896.

II.

THE PREVENTION OF TUBERCULOSIS.

Tuberculosis is one of the diseases in which the direct cause is positively known to be a specific micro-organism, the bacillus of Koch, without which the formation of true infectious tubercle cannot occur.

The presence of this bacillus in the diseased tissues, and in their secretions and excretions, its liability to enter the respiratory and digestive organs, when, in the absence of proper disposition, the discharged tuberculous material, has become dry and powdered into dust; and its possible presence in food products from tubercular animals are all familiar facts; and the communicability of the germ from man to man, from man to animal, from animal to animal, and again from animal to man through the medium of the air and food is so well established that there is no room for doubt.

Thus in every case of tuberculosis the infecting germs have been derived from a previous case; and if it were possible to destroy all tuberculous discharges, and avoid all tubercular food products, the problem of further infection of man and animals would be solved; and the disease would disappear, after those now infected had passed away.

Our direct preventive measures must therefore have for their object the proper disposition of all tuberculous discharges; so that it shall be impossible for them to enter the air, and be inhaled, to be deposited upon our food as dust, or to enter the water which we use for domestic purposes; and the avoidance of all food products which being derived from tubercular animals may convey the germs to the digestive tract.

The degree of difficulty which must be encountered in such an undertaking is, however, such that we cannot hope to extinguish tuberculosis in man and animals; since it would require exact bacteriological knowledge, and sincere co-operation, not only on the part of all physicians, but on the part of all other people, especially of those who already suffer from the disease, or who are members of households, communities and states, where the disease exists.

All that we can strive for, is the restriction of the evil, by which the opportunities for infection will be diminished; so that eventually the disease shall become less prevalent; and every preventive effort in an individual case must be considered as conducive to that end.

So far as the spread of the disease occurs through human tuber-

culosis, the medical profession can for the present be the only effective agency through which preventive efforts may become operative, and it appears doubtful to me, whether or not the enactment of laws, under which the patient or householder becomes responsible would be of material aid.

Tuberculosis is certainly not a disease which justified the quarantine of patients for their own good, and even if desirable for the protection of others it would scarcely be feasible to do this with perhaps several millions of people who suffer from it in one form or other in this country.

If we need law at all, it should provide that cases of tuberculosis should be reported by the attending physician, that he be furnished by the state with printed instructions as to the dangers of infection, and its mode of prevention, a copy of which he must certify to have delivered to the responsible householder who harbors such a patient, when he reports the case.

I also believe that in case of removal or death of a person suffering from the disease a report from the attending physician should be demanded, upon which he should be required to state whether or not the room or apartments occupied by the patient have been properly disinfected in accordance with the instructions furnished; and if not, compulsory action by the local health authorities should be provided.

Such a law, could meet no reasonable opposition from the medical profession on the ground of meddlesome interference by officials with private patients; and it would pave the way to more rigid measures in the future if experience would point to their necessity and benefit.

The amount of benefit to be expected from such a law may be variously estimated according as we look at the probable results.

My experience with several thousand patients, previously under the care of other medical men, shows that only in a minority of the cases, were the patients, or accompanying friends fully aware of the danger of infection from the sputum and excretions; and a less number still, had received any detailed instructions as to its prevention.

On the other hand I found that most patients were conscientious in observing the rules given them in proportion to the degree of their intelligent comprehension of the desired object; and any lack of interest on their part was quickly removed, when they understood, that they

were in danger of further infecting themselves, and that their recovery depended also in a large measure upon avoiding it.

I believe, therefore, that many physicians neglect to properly instruct their patients, and their families, or, are not explicit enough to make them understand all the details and objects to be obtained; and conclude, that explicit printed instructions in plain and simple language to the patient or householder, would as a rule be followed, and that such a law would keep the physician's interest in prevention more active by being consulted about the details.

The effective disinfection, compulsory, or voluntary, of the rooms occupied by such patients is certainly a very desirable object.

In the restriction of infection from animals we can proceed more rigorously; for no one would for a moment think of comparing the value of animals, or of any number of them, with human life.

All efforts that are possible should be made for the enactment of laws for compulsory inspection and the application of the tuberculin test in cattle, and, perhaps eventually, also in swine, by competent persons at the expense of the state. The law should also provide for compensation to the owner, if a diseased animal is destroyed, and should include necessary provisions for the isolation of healthy cattle and for disinfection of stables and enclosures.

The owners would indeed find that such a law is also to their own pecuniary interest, and though compensation would be a moderate one, it would in a measure help to bear the loss incurred by the individual for the benefit of the community.

In estimating the prospective benefit from protective measures against infection from tubercular animals we may well remember, that, we are not yet ready to affirm, that human tuberculosis is chiefly contracted from human subjects of the disease; for myself I am free to say that I should not be surprised if it were eventually demonstrated, that the milk and flesh of tubercular animals are equally if not more responsible for the prevalence of the disease among man.

If we now proceed to consider the measures which we must advise and advocate for the protection of non-tubercular individuals against tubercular infection, it will be apparent that the non-infected members of society can do little for their individual safety, unless they isolate themselves from all intercourse with their fellow beings by removal to previously non-inhabited localities.

By the aggregation of man in towns and cities, and by existing relations with others through the manifold avenues of communication, and by inter-dependence for services and supplies, the advent of the tubercle bacillus through dust and food in the air passages and alimentary canal must be of common occurrence while the mode, time and place of the infection can rarely be demonstrated.

The occurrence of actual infection may not be subject to demonstration for months and years, during which time the disease may be latent, or may involve only parts and organs to a degree, that there is not sufficient disturbance of their integrity and functions to cause appreciable anatomical alterations or symptoms which attract attention.

For prevention of infection from man to man, it is chiefly to the patient and to the persons in his immediate circle, that we must address our efforts, and for success we must appeal to their own interest instead of pleading for the protection of others.

If we do this with sufficient clearness to secure conviction as to the existing danger to themselves, and to those in whom they have a direct interest, we find as a rule that they are desirous of protecting themselves, and they are liable to faulty conduct and methods only on account of their deficiency in knowledge of the necessary details in dealing with micro-organisms.

Thus it is of greatest importance that the personal danger of reinfection and infection of members of the family shall be made to appear the chief object of our solicitude.

If the resulting benefit from right action is presumed to be chiefly in the interest of persons in whom the patient and friends have no special interest, and if this benefit is to be a negative one, to arise possibly at some future time, the probability of the patient or his friends acting rightly, especially at the slightest sacrifice of convenience to themselves, is greatly diminished.

But if the compliance with our instructions for the benefit of strangers should imply a sacrifice of even small pecuniary value, if for instance we should ask for the purchase of disinfectants, nine chances to one, we should have to supply them ourselves, and more likely than not, they would not be used in an efficient manner, even if supplied without cost.

Most of the measures which we require are, however, primarily in the interest of the patient and friends; as to the former, there can be no

reasonable doubt that he is in danger from his own tuberculous discharges.

If his infection can have occurred in the first place through the carelessness of some one else, his own carelessness may be the cause of the infection of organs not yet involved in the disease, or of the infection of still intact portions of organs in which the disease is established; as for instance the lower lobe of the affected lung, or the non-involved opposite lung, an occurrence under which the chances for recovery may be absolutely lost.

For the present we must give directions for, and insist upon the proper disposition of tuberculous discharges, without a special law making it obligatory, realizing that we are in truth liable to like censure from neglecting precautions, as we would be, should we disregard to give proper advice against the spread of diphtheria, typhoid fever, or small pox.

The public has really a right to demand of physicians the exercise of a reasonable amount of knowledge and skill, and of proper efforts not only in diagnosis and treatment, but also in guarding against the spread of disease.

The literature of the past sixteen years is so replete with evidence of the infectious character of Tuberculosis, through the medium of tuberculous discharges, that for a physician, the pleading ignorance thereof, is of no avail; and even those who for any reason refuse to acquiesce in the general belief, are, nevertheless responsible to act upon it, until they have furnished sufficient proof to the contrary to reverse the current of present medical opinion.

This being conceded, we may consider what our measures and directions shall be to our patients and to their attendants.

In pulmonary tuberculosis the sputum is necessarily the especial object against which we must direct our measures; and first we must prevent its promiscuous deposit.

Patients must, therefore, be provided with expectoration glasses, cups, or cuspidors, containing water, or with sanitary cuspidors made of water-proof paste-board, and all expectoration must be deposited into such receptacles.

The patient must be instructed to use great care to deposit the expectoration into the receptacle, and not upon its surfaces, or adjacent to it, as is very likely to be the case with careless persons.

(TO BE CONTINUED.)

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THE INTERNATIONAL CONGRESS FOR TUBERCULOSIS.

In the succeeding pages will be found a synopsis of the proceedings of this congress, which assembled in Berlin on May the 24th of this year. Until the transactions are published in full it will of course be impossible to review the work which has been accomplished.

It has, however, been stated almost with an accent of disappointment that no great, heretofore unknown truths had been announced, but those who judge the results of the congress in this manner appear to lose sight of its scope and aim.

It is indeed true that the subject of tuberculosis was thoroughly reviewed and discussed in most of its important phases, resulting in the re-affirmation of established truths, rather than in new propositions and new theories.

This part of the work of the congress may, however, be regarded as almost incidental to its main purpose, which above all other things was the furthering of the project to erect popular local sanatoria for the benefit of the poor and of the working classes even with the hope of furnishing accommodation at no very distant date for all tubercular subjects in the civilized world.

Such popular sanatoria insure at once greater public prophylaxis, by segregation with better individual therapy, and by operating simultaneously with state measures for the extermination of tuberculous animals. They are destined to more and more limit the disease and eventually to stamp it out, since the bacillus of tuberculosis has no existence in nature apart from its victims.

One of the most striking statements reiterated at the congress was that sanatoria may be successful in therapeutic results in almost any

country or locality provided that certain minor requirements relating to dust, to extremes and sudden changes of temperature are fulfilled. In other words the fetish of "the curative climate" is no longer to be worshipped, and while people who have sufficient means will continue to travel to ideal resorts, and private institutions for the treatment of this class are properly located at such places, the poor mechanic, clerk or shop-keeper will not need to be deprived of the advantages of institution treatment, because he has no money for journeying and living at remotely situated and expensive health resorts.

Even in climates usually considered as predisposing to the acquirement of phthisis, the advantages of the open air and institution treatment are becoming more and more apparent, and there is no reason to doubt that eventually entirely satisfactory results will be attained in institutions located in what is now considered an unfavorable climate.

Judging from the reports which have reached us, and from the influential standing of its leaders and many of its members we have no hesitancy in saying that this congress will prove to be all that the most enthusiastic sympathizers have expected and foretold, that it will not only mark an era in medical history, but in the progress of humanitarianism as well.

"THE TWENTY-FOURTH OF MAY."*

By. Dr. A. Eulenburg.

Since the revolutionary discoveries of Robert Koch have enabled the scientific doctrine of tuberculosis to be erected upon a wholly new foundation, individual prophylaxis and therapy have enjoyed in connection with these doctrines a high degree of enrichment and progress; the gradually appearing thought of a public, central and local care for the tuberculous, however, had thus far been announced solely in isolated and scattered beginnings; and one hardly dared at first to think of antagonizing tuberculosis as a public plague, by wholesale measures carried out along single lines.

Matters stood thus when less than five years ago (September 6, 1894) Ernst von Leyden delivered an inspiring address, memor-

*Editorial translated for the Journal of Tuberculosis from the Deutsche Medic. Wochenschr. No. 22, 1899, published in honor of the Congress.

able to all his hearers, at the International Congress of Hygiene at Budapest, which will live in the memory of the present and future generations as a boundary-stone and turning point in the history of the struggle against the greatest and most devastating of all pestilences.

Probably none, not even the most confiding would have ventured to anticipate that the word, spoken so timely, would be so powerful; that the sparks would so blaze upward; that the seed so recently sown would yield so luxuriant a harvest! It is still in all of our recollection how a similar meeting in Berlin quickly followed the Budapest gathering, how in 1896, under the direction of von Leyden, Althoff and B. Fraenkel the Berlin-Brandenburg Sanitarium Union for patients with pulmonary affections was formed; how, thanks to the energetic co-operation of Gerhard and Pannwitz the efforts of the Red Cross made an emphatic beginning in the same direction and how soon these and all related endeavors found a natural meeting and uniting place in the German Central Committee for the erection of Sanatoria for Consumptives founded under the Protectorate of Her Majesty the Empress and Queen, with the Chancellor, Prince Hohenlohe as honorary president.

In the meantime, thanks to the harmonious co-operation of central and local authorities, unions and corporations, to public and private benevolence, Germany has become almost covered in all its provinces with a net-work of sanatoria, part of which are already completed and given over to their allotment of salutary activity, while others are still in course of construction; and of this latter series almost every month sees a new addition of the same worth and importance as its fellows.

Only within the past few days the dedication of a new sanatorium in one of the Hanseatic states furnishes testimony as to how (to use the expression of a participator) patriotic municipal sentiment and philanthropic administration of government may by working together create a complete memorial.

And we now see as the acme and crown of all these efforts a Congress assembled in the German capital, of which it may be said that the world perhaps has never before seen one led by like views and inspired by the same spirit, a congress which has inscribed upon its banner "The Warfare Against Tuberculosis"—which has made it its task to bring instructively and warningly before the eyes of the most diffuse circles the disease "Tuberculosis" as the people's pestilence, its dangers, and the ways and means of preventing and neutralizing it.

It is not intended to waive new, brilliant and sensational discoveries, nor to announce essentially new contributions to progress, but rather to

render conspicuous the knowledge concerning this pestilence already at hand, hygienic, prophylactic and therapeutic, in popular characters suitable to the age, for general possession. We may say with pride that these efforts, originating in German medical circles, cannot fail to have the most sincere sympathy, the most devoted acquiescence and the most joyful participation, from throne to cottage.

May then the wise and thoughtful work of this congress, planned with might and perfected with a rich organization, unite itself to the almost transcendent hopes and immeasurable prospects for public and private weal—may the blessed fulfillment of all that is planned and hoped for not fail—and may to its deserving promoters and furtherers the joyful pride of retrospect upon the successful deed, be granted in full measure!

ORGANIZATION OF THE CONGRESS.

The International Congress of Tuberculosis was due to the efforts of the Central German Committee for the establishment of Sanatoria for Pulmonary Diseases, and its opening exercises occurred on May 24, 1899, at the Chamber of the Reichstag, Berlin.

The congress was under the patronage of the Empress of Germany, and the arrangements were carried out by a large committee under the presidency of the Duke of Ratibor and Prof. von Leyden. The invitations issued by this committee resulted in an attendance of over 2000 of whom 112 were delegates from foreign countries. The representatives of the United States were Surgeon Boyd, U. S. N., and Dr. Nuttall (both these gentlemen were among the honorary presidents of the First Section); also Dr. Vaughn (Marine Hospital service), and Dr. de Schweinitz (Agricultural Bureau). Other countries were well represented, and delegates were present from Persia, Japan, Guatemala, the Argentine Republic and other remote localities. The representatives from the culture countries naturally included many men distinguished for their work in connection with tuberculosis. On the day before the opening of the congress the Duke of Ratibor made a report to the Emperor in regard to the arrangements of the congress; the Emperor requested that the foreign delegates should be presented to him on Sunday, May 28. The Chancellor Prince Hohenlohe also invited the members of the congress to a garden party on Tuesday, the 25th.

The German press unanimously welcomed the congress and drew comparisons between it and the Peace Congress at Hague, regarding

both meetings as having a common tendency for the welfare of mankind through co-operative reform.

The Parliament Buildings were given up almost entirely to the congress, and the administrative details were in charge of German army surgeons and officers.

The first reception was held in the Parliament House on Tuesday evening and was semi-official; the two presidents received the visitors in the Rotunda. The Empress was represented by Baron von Knesescheck and the Chancellor by Count Schoernberg. The attendance included many eminent men and a large number of ladies. The walls of the Rotunda of the Parliament House were adorned with plans of sanatoria. The various sanatoria spoken of in the Transaction of the Congress were almost all represented in the plans and diagrams on exhibition. Refreshments were furnished by the State.

On the opening day of the congress the Empress and her suite were present, and the first address was made by the Minister of the Interior, Count Posadowsky, and remarks were made by the Duke of Ratibor, the Burgomaster and a number of eminent physicians.

On Wednesday evening the Burgomaster of Berlin gave a reception to the members of the congress and their friends, followed by a promenade concert in the Exhibition gardens. On Tuesday afternoon the Chancellor gave a garden party at his official residence which was a success in every respect, while in the evening a large number of delegates attended the opera at the Kaiser's invitation. On Friday evening Prof. and Mrs. von Leyden gave a brilliant reception, semi-official in character.

The congress was formally adjourned at the end of Section V. by the Duke of Ratibor, who caused a vote of thanks to the Chancellor and others to be passed.

PROCEEDINGS OF THE CONGRESS. (1)

The congress opened with an address of a general character by Grainger Stewart. He alluded to the spread of the popularity of the open-air treatment of phthisis in Great Britain even when rain, mist and east winds prevail.

Hirschberg followed with another address of general purport made up of felicitations and historical allusions. Regret was felt that Professor Koch was unable to attend the congress; he being then in Italy studying malaria.

FIRST SECTION: STATISTICS.

The first practical section was devoted to the matter of dissemination of phthisis. Koepler presented some statistics including the mortality record of pulmonary phthisis in Germany during the four years 1894-1897; it amounted to 87,600, which is 2.95 per 1000 living.

Krieger discussed the influence of occupation upon tuberculosis, dividing the various vocations as follows, in the order in which they contribute to the spread of the disease: (a) Sick nursing and similar occupations involving direct exposure; (b) occupations which tend to induce catarrh of the finer bronchi thereby producing local susceptibility; these include those trades in which fine dust is necessarily inhaled; (c) occupations in which the attitude assumed while at work tends to prevent the expansion of the upper part of the chest; (d) sedentary callings which tend to cause a general weakness of the muscles, including the heart.

Schjerning read a paper on tuberculosis in the German Army. A decline in the mortality had been noted since 1882, but there was a remarkable rise in 1890-'91 and 1891-'92, probably attributable to influenza. He agreed with Laveran that tuberculosis in the army was a question of hygiene and of recruiting. The mortality rate was higher in barracks in large centers of population and wherever the men followed indoor occupations. Heredity was present in 29 per cent. Recovery was obtained in 1.3 per cent. only, although good improvement was noted in 22 per cent.; death took place in 16 and negative results occurred in 60 per cent.

Bollinger's paper was upon tuberculosis in lower animals. The disease as affecting cattle and pigs he holds as identical with human tuberculosis. Animals and man spread infection to each other, but the contamination of man is far greater than that of animals. Milk of tuberculous cows is the vehicle par excellence in the diffusion of the disease, and in this way we are now able to explain the infection of swine which are fed on infected milk; the glandular tuberculosis or scrofulosis of children being probably also due, in the main, to tuberculous cow's milk.

These papers were jointly discussed. Kuthy gave the annual mortality of consumption in Hungary as 60,000; the total morbidity of consumption 400,000. Schmid of Bern stated that the mortality in Switzerland had not changed in twenty years.

Brauer of Heidelberg called attention to the great mortality of con-

sumption among tobacco-workers, due in part to crowding and in part to dust.

Meyer of Berlin said that men employed in the printing trades showed a slight improvement in respect to the prevalence of phthisis among their members, but no such improvement was noticeable in the women employed.

SECOND SECTION: ETIOLOGY.

Flügge of Breslau discussed the relation of bacilli to tuberculosis. There is no doubt that Koch's bacillus is the only direct cause of all kinds of tubercle, both of man and animals. Bacilli are not always present in the sputum because they perish rapidly outside the body. Acid-proof bacilli are at times found in organs which are sound, but they are not Koch's bacilli. These two objections, already answered, make up all that can be said against the pathogenic character of the tubercle bacillus.

Fraenkel stated that the bacillus was only dangerous to others than the host when it had egress to the outside air, etc., as in the sputum expelled from cavities, and in infected milk. In sputum the bacilli are usually exposed to destruction by light, putrefaction, and dessication, so that they are certain to be destroyed within a year at most. They never flourish apart from tuberculous subjects, and are not ubiquitous in nature.

Pfeiffer of Berlin stated that we rarely have pure tubercular infection, as complications soon set in. Streptococci are the chief allies of the tubercle bacilli, and the cause of hectic, through their poisonous products. We should always segregate the hectic cases in a sanitarium, as in this way we remove the other consumptives from immediate danger of this complication.

Loeffler of Greifswald said that tuberculosis could heal spontaneously. Children are very rarely born with tubercular lesion, when they appear to be congenitally affected it is really contagion from tuberculous lesions of the mother's genitals. A tuberculous father cannot procreate a tuberculous child. As yet we have no proof of any absolute immunity towards phthisis.

DISCUSSION.

Birch-Hirschfeld: Nearly all cases of death during the first stage show on autopsy that the disease begins in the mucosa of a medium-sized bronchus.

Launelongue (Paris) stated that it is very rare for a trauma to become a tuberculous lesion.

Brieger, (Breslau): Hypertrophied tonsils are not necessary scrof-

ulous, but tuberculosis may cause tonsillar hypertrophy. This latent tonsillar tuberculosis does not often lead to pulmonary phthisis but is a menace to the neighboring organs, such as the middle ear.

Courmont (Lyons): An agglutinative reaction was obtained in all but 10 of 186 tuberculous cases, using homogeneous cultures of Koch's bacillus tuberculosis, and this reaction will doubtless be of value in the diagnosis of latent and masked cases.

Wolff (Berlin): In only one case out of sixty could tuberculosis be rendered transmissible by heredity in animal experiments. Courmont gave an account of cases of tuberculosis where a bacillus other than Koch's was alone found in the lesions, and Flugge replied that it was often extremely difficult to find Koch's bacilli but they were certainly always present.

THIRD SECTION: PROPHYLAXIS.

Dr. Roth of Potsdam emphasized the following points: Supervision of tuberculosis by sanitary police; popularization of knowledge of the infectious nature of the disease, and of the earlier stages of the same; use of spittoon bottles made of paper, to be burned contents and all, and new ones used each day.

Prof. Heubner (Berlin) said that tuberculosis is not congenital; of 800 children then under treatment there were no cases of tubercle in those under one year of age. The majority of cases were contracted at a later period by inhalation, and therefore children should be carefully guarded from exposure to tubercular adults. Children of tubercular parents contract the disease more readily than others and should be strengthened by open air treatment, cold baths, careful feeding, etc.

Prof. Kirschner (Berlin) discussed marriage in connection with tuberculosis. Marriage of a tuberculous with a non-tuberculous person is bad for the spouse, and for the children. There is much less danger of dissemination among the well-to-do than with the poor. Public opinion should be taught to discountenance the marriage of young people inclined to tuberculosis, and in the case of apparent recovery from the disease at least two years should elapse before marriage. Married people should be warned in the case of a tuberculous spouse as to the risks run by members of the household and how to minimize them.

Prof. Rubner of Berlin considered the prophylaxis of the disease in the case of congregations of people in factories, railway carriages, etc. Tenement houses require new building laws, and a system of inspection, while in factories greater precautions are needed to prevent inhalation of

dust. Medical inspection should be such as to lead to the exclusion of tuberculous individuals from mills, and workshops. Placards should be posted in omnibuses, railway coaches, etc., requesting passengers not to spit on the floors, and sleeping cars should be carefully cleaned after each day of use.

Prof. von Leube (Wuerzburg) took the subject of hospitals, where the most absolute cleanliness was imperatively demanded. Patients should always cough with a pad of cotton or wool before the face, and this pad like the contents of the cuspidors should be burned before it can dry. Servants should wear muslin veils or masks while making the beds. While the sweat may not contain bacilli, it is best for the doctor and nurse to be on the safe side and disinfect the hands after handling tuberculous patients. Isolation of phthisical cases is not necessary in general hospitals but is nevertheless advisable. Special tuberculosis wards should have broad verandas for outdoor-life.

Virchow spoke on the subject of the spread of tuberculosis by articles of food. Cattle are the chief spreaders through their milk and meat and then come pigs and in the third place poultry. The existing laws on slaughtering in Germany would be sufficient if made uniform. Imported live cattle should be subjected to the tuberculin test. Cow's milk is by far the most dangerous source of infection. As it is impracticable at present to destroy all tuberculous cattle, we must depend upon boiling the milk. Pigs are more subject to tubercle than has been supposed, the chief seat of the disease being in the lymph-glands of the neck. By removing these glands by incision (which can readily be done) an element of danger may be eliminated. The danger from poultry is lessened by the fact that fowl-tuberculosis differs from the human form of the disease. Still Virchow believes in destroying tuberculous poultry. The paper concludes with a denial of the existence of congenital tuberculosis in man.

A number of papers in this section were not read for want of time and for the same reason there was no general discussion of the papers read. Among the papers which were not read was one by Prof. Obermueller of Berlin who stated that tubercle bacilli are frequently present in butter.

FOURTH SECTION: THERAPEUTICS.

Curschman (Leipzig) discussed the curability of phthisis, and stated that from the histological standpoint cure was very easy. Cure with persistence of scars and bronchial obliteration is more frequent, and

cure in the sense of recovery of general health with latent persistence of foci of disease still more common. The improvement in the results of the past years is due to physical and dietetic management. Lung sanatoria give a percentage of permanent improvement which amounts to about one-fifth of all cases treated. We know now that the influence of climate is secondary to that of good general management. Any climate with pure air and absence of great extremes of temperature will answer well enough. There are no "immune" zones of climate. The problem of mixed infection is still unsolved. In general the earlier the period and the smaller the focus the better is the prognosis.

Kobert of Bostock took the subject of the medical treatment of tuberculosis. There is no specific medication and in galloping phthisis and acute miliary tuberculosis there is not even a rational plan of treatment which can save life. In early stages of ordinary phthisis the Brehmer open-air method suffices to cure without medication. In surgical tuberculosis the best remedy is iodine. Narcotics and especially codeia are of great value in laryngeal phthisis. In emaciation and cachexia, stomachics, artificial food, creosote and codliver oil are all of value. Antipyretics (pyramidon, etc.), are indicated whenever rest and hydrotherapy will not reduce the temperature. Inhalation of substances like turpentine benefits fetid suppuration. Opiates and astringents are of value in intestinal tuberculosis although lead is contraindicated. Oil of camphor, cinnamic acid and similar new remedies may be indirectly beneficial by exciting leucocytosis.

Brieger of Berlin discussed the therapeutic use of tuberculin, and stated that both of Koch's products must be looked upon as essentially specific in action. They act only upon tuberculous products but are powerless in the presence of secondary infection, although even here some improvement may be noted. In pure early lesions tuberculin can certainly produce resolution in some cases, and where it is inert, there is always a possibility that a larger dose would have acted favorably. The old tuberculin is of the greatest value for diagnostic purposes both in man and animals.

Weber of London presented a paper on the influence of climate and sea-voyages in the cure of tuberculosis while Dettweiler (Falkenstein) discussed hygienic and dietetic management; in the course of his remarks he eulogized the "permanent air and rest cure." It is not necessary to leave one's own country for treatment, as the nature of climate is secondary in importance to the quality of the sanitarium and physician.

DISCUSSION.

Schroetter of Vienna showed two cases of healed tubercular laryngitis. Each patient had undergone tracheotomy, and had been cured by hygienic and dietetic management combined with remedies. Winternitz of Vienna eulogized hydropathy as the best weapon with which to fight tuberculosis. The water should be fresh and cold. In a material of 400 cases he had obtained improvement in nearly 80 per cent., with arrest and relative cure in chronic cases. Landerer of Stuttgart is a believer in the efficacy of cinnamic acid which he has used for seventeen years, either subcutaneously or by intravenous injections. He has cured 57 cases by using this remedy. Cervello of Palermo recommended inhalations of formaldehyde as extremely efficacious. Sarfert of Berlin regarded surgical cases as a great menace to the health of others and insisted that they ought to be treated in sanatoria. Egger of Basel recommended colony life in high altitudes.

FIFTH SECTION: SANATORIA.

Prof. Liebreich opened the section with the announcement that the Balneological Society (of which he is president) had decided to erect a monument to Brehmer, the pioneer of the modern sanatorium and open-air treatment of phthisis. His proposition that the delegates of the congress join in the movement to honor Brehmer was unanimously accepted.

Mr. Gaebel, President of the Imperial Insurance Department stated that the sanatorium movement was for the direct benefit of the working classes, and it was well to know that many of the delegates were working men. It was not enough to build sanatoria however; the public must be taught to understand the subject of tuberculosis.

Prof. von Leyden traced the history of the sanatorium movement from 1880 to the present time. In 1892 the people's sanatorium at Falkenstein was opened, and the Imperial Insurance Company took up the movement and erected its first sanatorium for its consumptive risks in the Harz mountains.

In 1896 the Berlin-Brandenburg Sanatorium Society was formed and began to construct the Belzig Sanatorium. At the same time the Red Cross Society joined the movement and built the Grabowsee Sanatorium.

Finally all these independent movements were united by the foundation of the Central Committee with the Imperial Chancellor as President. At present there are 33 of these people's sanatoria either in operation or nearing completion. Auxiliary societies looked out for the fami-

lies of patients in the sanatoria and sought employment for discharged patients.

Councilman Meyer of Berlin stated that the sanatorium plan had proved itself so valuable the demand for them was too great for private philanthropy alone, and that the enterprise should become a vested interest to insure perpetuation. Employers, through their interest in the health of their employees; sick clubs, insurance companies, trade unions and all organizations who had to pay benefits, annuities, etc., should be led to invest in some way in these sanatoria.

Dr. Friedeberg of Berlin, Medical Adviser to the Berlin Sick Club's Central Committee, spoke of the relation of sick clubs to the sanatorium movement. The classes which furnish the membership of these clubs were ravaged by phthisis.

The mortality of members from that disease was 50 per cent., and a like proportion of incapacitations was due to the same cause. The necessity of waiting for a free bed should be done away with. The speaker suggested that popular lectures, hygienic tracts and all similar measures should be adopted to educate the masses, and that every member of a sick-club should be examined once a year (obligatory if necessary), including a sputum examination for which the Provincial State Laboratories should charge no fee.

State Architect Schmieden of Berlin discussed the planning of sanatoria. A sanatorium should be for one sex and one class. The situation should be sheltered and sunny, with wooded surroundings and absence of dust and smoke.

The water supply and drainage should be of the best. The heights of buildings should not exceed two stories. The kitchen and laundry should be detached and bedrooms should not be used for living rooms. The minimum air-space should be 30 c. m. per bed.

Baths should not be in the cellar. Walls, floors and ceilings should be of such material that cleaning will be facilitated. Among other recommendations was one for sterilization of soiled clothing before having it laundered.

Staff-Surgeon Schulzen advocated the pavillion system, with Doecker's movable barracks during the summer. There should be a small number of single bed-rooms, but most of the sleeping apartments should contain from two to four beds.

Meals should be eaten in common. The nurses should be educated ladies. The average cost per day in a sanatorium with 110 beds should be about seventy-five cents per patient.

Results to date had been good but it is too soon to decide upon the actual value of the method. The selection of cases in favor of the earlier stages of the disease, extension of the period of treatment, establishment of convalescent homes where the patients could pursue some occupation would all tend to help the showing of the value of sanatoria.

Cases should be followed up by correspondence, etc., after their discharge.

Staff-Surgeon Pannwitz of Berlin discussed the subject of the families of patients in sanatoria. The latter could not be expected to improve if they had occasion to worry about their families. The possibility of not being able to secure work after discharge provided another source of worry. These two problems were too great for State supervision and it is here that private philanthropic societies should step in.

DISCUSSION.

Dr. R. Walters of England opened the discussion by stating that the sanatorium and open air plans of treatment of phthisis were by no means new in England. The idea of people's sanatoria was, however, undeveloped, but before long these institutions would be erected. At present there were special hospitals and homes for consumptives, also general hospitals and convalescent homes.

Dr. Mayer of Frankenthal believed that sick-clubs ought to exclude all persons in any way predisposed to tuberculosis.

Prof. Ewald of Berlin said that in the warfare against tuberculosis prophylaxis was all important and that twenty years experience had taught him that there was no better prophylactic than children's seaside sanatoria for the prevention of the beginnings of phthisis. It is to be earnestly desired that more of such institutions be forthwith erected.

Drs. Salomon and Baginsky agreed with Ewald and gave details relating to children's seaside sanatoria.

Dr. Weicker gave statistics of 1800 patients discharged from sanatoria during the past four years. The proportion of those able to return to work constantly increases.

Dr. Predohl (Hamburg) said that the experience derived from 2000 cases had led him to oppose the admission into sanatoria of patients in the later stages of tuberculosis.

Dr. Reiche of Hamburg stated that sixty per cent. of the discharged in the Hanseatic Sanatoria were able to return to work. Dr. Hohe of Munich wished to bring about the erection of sanatoria for the middle classes.

GERMICIDAL INHALATIONS IN PULMONARY TUBERCULOSIS.

The proposition to inhale gases, vapors or sprays having germicidal properties has been an alluring one in the treatment of tuberculosis ever since Prof. R. Koch demonstrated the specific cause. At first thought it may appear to be quite possible to introduce germicides directly to the seat of the disease, or even to reach the germs in the tissues. Many times practical results have appeared to justify such a theory, the improvement noted seeming to stand in relation to the method employed.

From the time of the use of animal emanations and gaseous effluvia of cow stables as curative inhalations in phthisis, all known germicides have been used; and we need only review the two decades just coming to a close and which more particularly represent the period of evolution of the germ theory, to find among the more prominently advocated methods of intra-pulmonary treatment by inhalation, the use of sulphur vapor, of hydro-fluoric acid, chlorine, bromide, iodine, of the various preparations of phenol, thymol, creosote, essential oils, solutions of corrosive sublimate, powdered iodoform, boric acid, super-heated and cold air, etc., etc.; all calculated to destroy or inhibit the germs with which they come in contact in the respiratory tract. As more recent additions to this list we have formalin and formaldehyde gas.

All these and other germicidal remedies having failed in their internal use, the inhalation method was the only alternative; and as already stated it was a tempting proposition to apply them directly where supposedly they could do the most good.

If sufficiently tempting to the medical profession to come into general use, the method appeared the more so to patients entirely unacquainted with the facts which limit and negative the object they were calculated to attain.

What could be more reasonable to a patient than the belief that these germicides, known and proved to destroy disease germs, in so many minutes or hours when brought in contact with them, when directly introduced as a gas, vapor or spray into his diseased lung would destroy germs there also; and thus by removing the cause cure his disease?

The rapid succession of one germicidal preparation to the equally

rapid abandonment of others, indicated that the use of the predecessors had not been as satisfactory as was desired or hoped for; but the improvements often noted in the patient's symptoms, in the course of such treatment, gave always renewed hope that the latest addition was the panacea looked for.

Such being the present status of the inhalation treatment of phthisis, it would be well to examine the degree of its justification, that of the limitations to which any or all remedies administered in this manner must necessarily conform in tuberculosis, and the extent of the real benefits which may be obtained.

The proposition to destroy bacteria with germicides rests upon unquestionable evidence; and the degree of power of individual remedies of this class over particular species of pathogenic germs has been carefully and repeatedly examined and determined.

In experiments for this purpose direct contact of the remedy in liquid media unable to neutralize or diminish its action has usually been employed. In other words the conditions were such that the remedy could produce its full effect. Many of these remedies have also been proved to exert a like or but slightly diminished effect, when brought in contact with bacteria upon clean open wounds, and upon the cutaneous surfaces.

The secretions of mucous surfaces have been found a more or less formidable obstacle to the action of germicides, especially to those which coagulate mucous or albumen as for instance carbolic acid and corrosive sublimate; but apart from such effect the presence of mucous or pus is a mechanical hindrance to penetration; and if not this, they dilute and reduce the action of the germicide in proportion to their quantity present. Only a clean surface offers the best chance; and in this respect we may be well governed by experience in surgical practice.

When applied to a clean wound and to well cleaned surfaces, and in sufficient concentration, germicides destroy the bacteria with which they come in contact; varying in this respect with the varying degree of resistance of particular species. The bacteria which are situated in or have penetrated the tissues, are more difficult to destroy; and as a rule their

certain destruction means also the destruction of the tissues in which they are found. In open ulcers, breaking down abscess-cavities, necrosed tissue, soft or solid, it is necessary to remove the diseased parts mechanically or to destroy them by escharotics; thus surgeons often apply pure carbolic acid to unhealthy surfaces, after first curretting and removing the invaded tissues.

Chemical and physical agents which have the power to destroy bacteria, have no exclusive or selective effect upon these; and many act with like destructive or detrimental effect upon the animal tissue cells in which the bacteria are found. In some instances we find that the bacterium-cell is even more resistant, and that chemical or thermal influences are destructive to the tissue cells in concentrations and degrees considerably below that which will be necessary to destroy the disease germs.

This is well illustrated in diphtheria, where, at the earliest local manifestations, by direct germicidal applications we have never been able to destroy the germs in the primary nidus, no matter by what germicide we attempted it, or in what concentration we used it. On the contrary we only opened the door for invasion of the deeper tissues; and such applications have been entirely and properly abandoned.

Internally administered against tuberculosis, no chemical or germicidal agent has as yet been found to be tolerated by the patient in doses that would even inhibit or retard the growth of the tubercle bacillus in artificial cultures.

To give for instance creosote in amounts that should kill the tubercle bacillus in 12 hours, we require a solution of 2 per cent.; to kill micro-cocci we require one-half of a per cent.; to restrain the growth of tubercle bacilli without killing them, requires solutions of one part in two thousand; the growth of micro-cocci, and of various saprophytes is checked in media containing one part in three to four thousand.

To make of the fluids of the body of a person whose weight is 130 pounds a solution of such strength that tubercle bacilli shall be destroyed by the creosote, we must introduce and keep constantly present for 12 hours two per cent. of creosote, or about two and one-third pounds; and to inhibit their growth and multiplication one ounce must be sup-

plied continuously; for with decrease, or with cessation of its presence the growth would be resumed.

Even these quantities would probably be inadequate unless used hypodermically; for all creosote given by the mouth is not absorbed: and in either case we would have to reckon with elimination which begins from the moment of absorption.

A dose of 15 minims three times per day is the largest amount of creosote that I have been able to give hypodermically; and in half of the cases even this dose was tolerated but for a few days, when kidney symptoms and bloody urine appeared.

The great resistance of the tubercle bacillus to the destructive effects of germicides is well known; and all pathogenic bacteria representing living cells are as much or more tenacious and resistant than are the animal tissue cells: the latter will therefore become inhibited in their life and growth or perish by the same chemical and physical agents which cause the inhibition or death of the bacteria.

In the use of germicidal remedies to which the tissue cells are tolerant, serious injury or death may occur through their poisonous effects upon the nervous system, the heart and other organs, from doses far below the amount required to inhibit or retard growth.

No matter what chemical we may select, or what thermic influence we may bring to bear upon such germs, we destroy the host, if we destroy the intruder; and though malaria and syphilis may apparently form exceptions to this rule, it certainly holds good for tubercle bacilli, and for the other pathogenic bacteria more or less frequently associated in phthisis.

If we examine the effect of the topical use of germicides on tubercular lesions, by direct applications, by bringing the more or less concentrated remedy into direct and prolonged contact, as for instance in the infiltrations and ulcerations upon the integument and visible mucous membranes, we meet with equally discouraging experience. Taking lupus as a fair example, who would hope that spraying upon its surface a germicidal solution in such mild concentration that it can be inhaled, would materially influence its unfavorable progress? Tubercular ulceration

of the pharynx and larynx prove alike obstinate to anything short of the entire removal of the diseased parts. Why then should the tubercular lesions in the lungs offer us a more favorable outlook?

In purely tubercular processes of the lung and in that stage which may be termed "the closed stage" we have only the continuous mucous membrane surfaces, upon which we may hope to act with our germicides. This closed stage represents the tubercle situated interstitially within the walls of, or closely adjacent to the capillaries and lymphatics.

The mucous membrane is usually free from disease, the lumen of the acinus, and alveolus being only more or less encroached upon by bulging of the tubercle situated below the epithelium. In addition there is often some exfoliation of the latter with increased moisture, due to the interference with the lumen of capillaries by pressure, giving rise to various degrees of congestion.

This closed stage resembles the stage of infiltration with tubercle in the larynx and other parts without broken surfaces; and in such cases the tubercle may soften and break down, and the liquid collection may break through; but before this happens we cannot hope to bring remedies in contact with tubercle bacilli directly; and the application of sprays, vapors or gases, whatever they may be, has absolutely no influence upon destroying such tubercle; not even if as in the pharynx or larynx we apply the solution of much greater strength than could be inhaled, and keep it in contact. Only after discharge may we hope to act upon the open surface and upon the germs in the discharging fluid; and then other factors will prevent sprays, etc., from reaching the seat of disease.

The amount of the germicidal spray, vapor or gas which may be inhaled short of danger of general poisoning, is greatly limited; and by the distance of the tortuous passages through which it must go to reach the acini, the amount is still further reduced. The final deposit or absorption at the point where contact with the tubercle is possible becomes so little that any inhibitory or destructive effect upon the bacillus in situ within the non-vascular tubercle would even in normally breathing lung tissue be beyond reasonable hope.

The outlook is still worse in a later period when through aggregation

of tubercles and by inflammatory processes the acini and alveoli become blocked or obstructed; and when no trace of such inhalation can possibly reach even the immediate surface under which the bacilli are located.

Under all circumstances the fluids of the tissues and the moisture upon the surfaces act as diluents of the remedy inhaled, which is rapidly absorbed into the blood, and can then only act through the blood.

In the presence of accompanying bronchial catarrh even the smaller bronchioles are difficult to reach, and when the lumen of the latter is obstructed by swelling or by secretions, none of the inhalant can reach beyond the larger bronchi.

In the "open stage" that is to say, the stage where caseous tubercles have softened, and the collection has perforated a bronchus, we have a condition simulating a sinus leading to a tubercular abscess cavity; the adjacent and out-lying tissue supplied by the perforated bronchus is usually collapsed or it is obstructed by non-softened or softening tubercles, and by secretions. No air, and therefore no spray, vapor or gas is likely to reach such a focus at all, and if it did, the extremely small quantity still further diluted by increased secretions could not be expected to influence the tubercle bacilli in the secretions, and much less those situated in caseous or non-degenerated tubercle, in the deeper tissues.

In that stage the involved area does not inflate as does the remaining healthy lung, and as the spray or vapor is aspirated in the direction of the air current, little or none will go beyond the larger bronchi, within the seat of the disease.

A further consideration against sprays reaching the alveoli directly under ordinary circumstances, lies in the extremely small amount of air which can leave or enter an alveolus in any one respiratory act. The air that enters an alveolus does not come directly from the air taken in from the outside with an inspiration, but from the column of air lying in front of the alveoli in the bronchioles, bronchi and trachea.

The writer has, however, not evolved the foregoing objections upon theories, but has practically studied the subject, including clinical employment of germicidal sprays, vapors and gases in every form and kind

heretofore recommended by others, or devised by himself; and also by laboratory experiment.

Since the latter only could give reliable results, it may be briefly stated as having had for its object, first the determination of the number of colonies obtained upon agar from the sputum of patients before being subjected to the germicidal inhalation; second, after the application of various germicidal sprays, vapors, and gases, in as concentrated form as the patient could bear. The applications were made in some trials directly from the atomizer; in others the patient's room was kept saturated with the vapors; and frequent direct inhalations were given in addition, the methods continued for a number of days, and in several instances for weeks. As some of the patients were confined to bed on account of their illness, their exposure to the germicide was continuous, day and night, especially when gaseous germicides were used.

The remedies experimented with were chiefly creosote, and its derivatives, phenols, essential oils and spirits of turpentine, pine needle oil, corrosive sublimate, nitrate of silver, iodine, chlorine, bromine, hydrofluoric acid, formaline, sulphurous acid gas, holzinol and formaldehyde.

The results of these experiments were that with due precautions in all respects, not one single specimen of sputum proved sterile, all exhibited numerous colonies; showing, however, a smaller number than the specimens from the same patients before using the inhalations. Especially notable was the influence upon the bacteria of decomposition; in a case with a gangrenous cavity; the sputum lost its offensive odor in the course of a week, under the influence of coarse sprays containing thymol and pine needle oil. Creosote, carbolic acid, and corrosive sublimate solutions produced slighter effects in the order named.

Specimens of such sputum containing tubercle bacilli showed no marked decrease in their number, and inoculations of Guinea pigs with such sputum produced virulent infection in every case where the animal did not die from infection with associated pathogenic bacteria.

In view of these facts, and of the general considerations in the preceding pages, it may be safely stated that germicidal inhalations in tuberculosis, whether employed in the open or closed stage of the disease, have

no influence over the specific cause, and are not able to entirely disinfect the expectoration; and that all that can be claimed for them is, that they limit and diminish the presence of other bacteria, especially of saprophytes, that is, of the ordinary non-pathogenic germs present in the air, some of which cause decomposition and putrefaction.

Nevertheless the writer is not an opponent to the use of inhalations in phthisis. On the contrary, he believes firmly in their utility as an important aid toward the control of cough and expectoration, and in their favorable influence over the frequently present bronchial catarrh. But for the accomplishment of these, it is not always necessary to use germicidal preparations, and for instance in irritative cough with sticking tenacious mucus, a spray of a warm normal salt solution is most soothing and effective.

Inhalation should only be employed with a definite object in view, and not upon the general theory that they act as germicides capable of inhibiting or destroying the specific germ of tuberculosis in any part of the lung.

Whenever they have been given with such an expectation and benefit has resulted in amelioration of the symptoms of cough and expectoration, or in a more general way, it was not because the tubercle bacilli were inhibited or killed, but because they acted soothing, stimulating, or astringent upon the mucous membranes of the bronchi, or mildly germicidal upon the secretions. According as either of such effects is desired, the physician must select his remedy and vehicle and determine the strength of the preparation, in the light of the known physiological and therapeutic effect of the particular medicament to be employed.

Such a medicament may perchance best be a germicide, as for instance a solution of nitrate of silver; but as already stated, the good effect observed is not necessarily due to its germicidal effect, but can be entirely due to its astringent stimulating action.

While there is little reason to believe that inhalations of any sort ever reach the diseased portions of a phthisical lung through the medium of the inhaled air (except the large bronchi), there is reason to believe that the condensation of coarse sprays may gravitate into deeper

and depending portions and thus may reach bronchiectatic and pulmonary cavities in sufficient quantity and concentration as to have a decided antiseptic effect upon stagnating secretions; and the writer could supply plenty of evidence to this effect. Such an effect can, however, be much better accomplished by intra-tracheal injections of antiseptic fluids.

That many of the pathological changes of the bronchial mucous membrane may be successfully treated with inhalations has not been a matter of doubt for the last half of this century; and that some of the good results in bronchial affections depend upon prevention of decomposition, owing to germicidal properties of the remedies used, is reasonable to suppose, and is demonstrated in practice.

That we can destroy the disease germs of tuberculosis or other pathogenic micro-organisms in the affected lung portion within the tissues is not reasonable to expect from theoretical considerations; and practical experiment and results admit of no such conclusion, all the good effects of inhalations being otherwise readily explained and understood.

Another benefit that results from inhalations does not lie in the spray or medicament at all, but in the deep respiration which accompanies their use; but this benefit can be best accomplished in cases free from active and progressive destructive processes by supervised exercise, by the use of the pneumatic cabinet, or in its absence by the free use of Dr. Denison's In- and Exhaler, a most admirable little inexpensive pocket instrument with which, when properly and persistently used, we obtain good effects upon the pulmonary circulation, strengthening of the respiratory muscles, restoration of collapsed air cells, and better ventilation of the lungs.

THE TUBERCULIN TEST.

Referring to reactions occurring in syphilis and other affections as observed by Dr. Otis and mentioned in his paper in this issue, this may, and possibly does, confirm the delicacy of the test, rather than detract from its value.

There is certainly nothing strange in the fact that some persons consulting us about a malady which produces active symptoms, are incidentally found to have an obscure latent tubercular deposit; especially not when it is shown that about 18 to 20 per cent. of all deaths occur from Tuberculosis and in between forty and fifty per cent. healed or latent Tuberculosis is found when death has occurred from other causes.

ORIGINAL CONTRIBUTIONS.

SOME NOTES UPON THE TUBERCULIN TEST. (1)

BY EDWARD O. OTIS, M. D., OF BOSTON.

So long as the tuberculin test has still many opponents as well as ardent adherents, all added evidence is of value in arriving at a final estimate of its worth in the diagnosis of early or doubtful tuberculosis. The problem to be solved is a two-fold one: first, is the test safe as now used; and second, is it reliable?

Those who have used it, and still continue to do so are quite unanimous in answering these questions in the affirmative, and the experience of the writer accords therewith. Such are Krause, Goffie, von Jakeh, Grasset and Wedel, Springthorpe, Cornet, Laudowzy, M. Beck, and many others abroad; and Trudeau, Whittaker, F. W. White, A. C. Klebs, R. C. Cabot, and others in this country.

I cannot help suspecting that those who consider the test dangerous even in the small dose now used, may be prejudiced by the unfortunate results which occurred in the early history of tuberculin from the enormous doses then used. We all look back upon that epoch with a shudder. To pass it by with the remark: "That its value as a test is not great, as reactions are obtained in several other diseases," as Fowler does, (2) is likewise unfair and misleading. Further evidence to be sure, is needed to establish its exact position as a diagnostic method, but enough has already been adduced to prove its success in the majority of cases. Its rival is the X Ray, but that requires an expert and an expensive apparatus which limits its use to the few. Any one can use the tuberculin test.

In view of the extremely favorable curative outlook the early case of pulmonary tuberculosis offers from the present methods of treatment, the profession has never been so eager to detect the beginnings of the disease as at present, and any aid in accomplishing this should be welcome, limited though it may be. We all recognize the fact that auscultation and percussion and the sputum examination fail to do this in some, we know not how many cases. If we delay until tubercle bacilli are detected in the sputum the favorable opportunities of the first stage may have passed never to return.

Before an absolute diagnosis has been established, one is naturally

(1) Read before the American Climatol. Assoc., May 9, 1899.

(2) "Diseases of the Lungs," Fowler & Godlee, 1898, p. 398.

disinclined, and lacks the requisite authority to institute a vigorous plan of treatment. Certainty of facts renders one resolute and swift in action. Here, then, is a test which is so simple that any one can apply it, and yet in the majority of cases, settles the whole question of diagnosis definitely and at once. If we shall, in the future, be able to determine some more exact method of dosage, discovering some constant ratio between the dose and the individual, we may find the test to be true in every case.

In common with others I have injected cases of proved pulmonary tuberculosis which did not react, at least in the general reaction; and, on the contrary it has happened to me to obtain a more or less complete general reaction when I could not feel convinced that any tuberculosis existed. It may be that, above a certain dose, maximum to the individual in question, what at least simulates a general reaction occurs in a healthy person, from a temporary poisoning by the tuberculin and its toxins; further evidence, however, is necessary to decide this question.

My observations extend over 111 (one hundred and eleven) cases, originally undertaken in an ambulatory clinic for the purpose of arriving at a conclusion as to the proportion of cases of cervical adenitis that were tuberculous. While making these investigations I embraced the opportunity to test all the cases which for any reason suggested tuberculosis, as well as several cases of syphilis, and a variety of other cases. My results of last year were published in the "Medical News" of July 9, 1898, and the tables of them, as well as those of this year I append to this communication.

In the total number of 56 cases of cervical adenitis taken without selection, there were 33 reactions, 6 slight reactions, and 2 doubtful ones. Throwing out the slight and doubtful ones we have 58.9 per cent., including them, 73.2 per cent., or an average of 65 per cent. which would indicate the proportion of cases of cervical adenitis that were tuberculous, so far as an inference can be drawn from 56 cases, and dependence can be placed upon the tuberculin test; but of course a larger number of cases and other methods of investigation must corroborate or disprove these deductions. It seems not unlikely, however, that this is not far from the truth, for Volland makes the proportion 68 per cent., and Dr. F. C. Moore out of 28 cases of chronic enlargement of the glands, mostly of the neck, which had to be operated upon for various reasons, found that 73 per cent. were tuberculous. In eight cases of syphilis and one doubtful one, there were four reactions. One of these cases was injected for

cervical glands and reacted moderately after 5 milligrams, and markedly after 10 mg., a few days later evidence of secondary syphilis appeared. Another, of chronic enlargement of the metacarpal bones of two fingers of the left hand, which was diagnosed by one surgeon as syphilis and by others as tuberculosis, reacted after 5 gm. still leaving the diagnosis in doubt.

There does not appear to be any doubt, then, that a certain proportion of syphilitic cases will react. This fact, however, would rarely interfere with the test in its more useful application, viz: In suspected early tuberculosis. In six cases of more or less advanced pulmonary tuberculosis, containing tubercle bacilli in the sputum, three gave no general reaction after 10 to 12 gr., and one none after 5 mg. Unfortunately the local conditions after the test were not noted.

Of course the only deduction that can be drawn from these few cases is that pulmonary tuberculosis when more or less advanced will not always give a general reaction from 5, 10, or 12 mg. of tuberculin; it is well to remember, however, the fact which White calls attention to: that the general reaction is slight and the local reaction marked in advanced cases, while in the early cases where the test is most useful the reverse is true. In the other general cases the result corroborated the clinical diagnosis in the majority of instances.

Whether any reaction occurred without the existence of tuberculosis one can only conjecture, but it is rather surprising that atrophic rhinitis and pharyngitis sicca should give a reaction without other evidence of tuberculosis. In no case did any serious result follow, although in several the general reaction was severe and accompanied with much temporary depression. The clinic being an ambulatory one, the subjective evidence of the patient, together with the objective symptoms apparent when he presented himself the next day at the clinic, were mainly relied upon to determine whether or not a general reaction had occurred. If from six to twenty-four hours after the injection, the patient complained of excessive weakness, sensations of heat and cold, nausea, anorexia, pain in the back and limbs, severe headache, sweating, either sleeplessness or somnolence, epitomized by him as feeling "very sick," "awful bad" or "miserable"; and he appeared the next day with coated tongue, rather a rapid, weak pulse, and a general appearance of marked depression, a general reaction was considered to have occurred even though the temperature at that time was not much, if any raised. The cases were generally afebrile at the time of the test.

Objection may be urged as to the accuracy of these tests where the patient could not be constantly under observation as in a hospital ward, but any one who has listened to the graphic recital of the reaction cycle, and witnessed the evidence of weakness and depression exhibited by the patient, would, I am sure, be convinced that a general reaction had occurred. Of course all reactions were not of the same intensity or duration. Moreover, since making my first set of tests a year ago, Dr. R. C. Cabot(1) in the Out-Patient Department of the Massachusetts General Hospital has followed a similar plan in tuberculin and other injection tests and has satisfied himself also that accuracy of results can be attained in an ambulatory clinic.

As a matter of convenience I gave the injection in the arm, generally subcutaneously, and the site of injection was swollen and painful for a few days. This annoyance can be avoided by making the injection deep in the muscles. Either Koch's original tuberculin or that made in the Adirondack Cottage Sanitarium Laboratory, kindly furnished me by Dr. Trudeau was used. As the latter seemed to be less concentrated than the former judging from results, I confined myself finally to Koch's, previous experience with which had taught me what to expect from certain doses.

One is likely to be misled, I think, if he uses indiscriminately tuberculin of different concentrations, and, therefore, he can better estimate his results if he uses a simple preparation of uniform strength. I dilute the Koch's tuberculin to a one per cent. solution. Unless one makes a fresh solution every day or two, the addition of a few drops of carbolic acid is desirable. With a pipette graduated into tenths and hundredth of a c. c., milligrams can be easily measured.

As to the dose there is much diversity of opinion. Some assert that they obtain satisfactory results with very small doses, as Grasset with two- to five-tenths of a milligram for an adult, and Gaffie, one-twentieth of a milligram for infants. The majority, however, use larger doses, from one-half to ten milligrams and occasionally twenty. A. C. Klebs regards 20 mg. as the maximum dose which can be injected safely, but he would not begin the test with this dose. It is not unlikely that this difference of opinion regarding the dose is largely due to the difference in the strength of the preparations used. I have never used over 12 mg. of Koch's tuberculin, generally from 5 to 10 mg. for an adult, and from $\frac{1}{2}$ to

(1) "Substitutes for Tuberculin in Diagnosis," by R. C. Cabot, M. D., Journal of the Boston Society of Medical Sciences, Jan. 1899.

3 mg. for children. At the Massachusetts General Hospital in Boston, 7 mg. is their usual dose, I believe.

I would summarize my conclusions as follows, subject to modification by further experience:

I. The tuberculin test indicates early tuberculosis by a general reaction in the majority of cases, before it can be detected by other methods, the X Ray excepted.

II. The dose to accomplish this is from 5 to 10 mg. of Koch's original tuberculin.

III. No injurious results occur from the use of tuberculin in these doses.

IV. Proved tuberculosis in a more or less advanced stage may fail to give a general reaction with doses of from 10 to 12 mg.

V. Syphilis gives a reaction in an undetermined proportion of cases.

VI. A non-tuberculous person may give a general reaction with a dose, above the maximum used in the test.

VII. The reaction may be delayed from 6 to 24 hours.

And as rules to be observed in making the test:

I. Always use the same tuberculin and of a standard strength.

II. Use aseptic precautions in giving the injection.

III. Make the injections deep into the muscles.

IV. Keep a two, three or four hourly chart of the temperature if possible, beginning twenty-four hours before the injection.

V. Allow several days to elapse before repeating the test.

VI. In early cases depend upon the general reaction; in later cases, if the general reaction is wanting carefully look for the local.

1898.

TABLE I.—CERVICAL ADENITIS. (1)

No.	Condition.	Duration.	Sex	Age.	Dose in mg.	Result.
1	Enlarged glands under right ear.	2 mos.	M.	18	1, 3, 10	No reaction.
2			M.	6	1, 2	" "
3	Suppurating gland in left neck.	1 mo. +	F.	10	1, 2	Reaction after 2 mg.
4	Cervical abscess in left neck.		M.	3 mos.	1-10, 1-5	No reaction.
5	Indurated mass under sternomastoid running up into region of the parotid. Has decayed teeth.	1 wk.	F.	40	2, 5, 10	Reaction after 10 mg. Swelling of joints of hands and feet persisting.
6	Chronic suppurating gland in left neck.	2 yrs.	F.	23	5	Reaction.
7	Enlarged submaxillary gland on right neck.	3-4 yrs.	F.	18	4	"
8	Glands on right neck, one suppurating five months.	2 yrs.	F.	11	2	"
9	Small glands both sides of neck, in occipital region.	3 wks.	F.		3, 5	No reaction.
10	Mass of 6-7 glands extending from the left mastoid downward along the muscle.	10 mos.	F.	20	5	Reaction.
11	Two glands in left neck below jaw.	3 wks.	F.	23	5, 10	Reaction after 10 mg.
12	Two glands in left neck.	2 wks.	F.	9	3	No reaction.
13	Suppurating glands in left neck; has had others within last two years.		F.	31	5	" "
14	Two discrete glands under sternomastoid. Old scars from others.		M.	7	1, 3	Reaction after 3 mg.
15	One discrete submaxillary gland.	2 wks.	F.	23	5	Reaction.
16	Cervical submaxillary glands.	1 yr.	F.	9	4	"
17	Glands in left neck; has had others on both sides.		M.	21	3	"
18	Glands in occipital region.	6 wks.	F.	19	3	"
19	Two glands in left neck.	2 wks +	M.	14 mos.	?	Doubtful reaction.
20	One gland in left neck.	1 wk.	F.	12	1-2, 1, 2	" "
21	Scar from old gland in left neck.		F.	7	1, 2	No reaction.
22	Glands in left neck; has had others.	8 mos.	F.	16	3	Reaction.
23	One large gland below angle of left jaw: has had others.	6 yrs.	F.	14	3	"
24	Three large fluctuating glands in left neck; has had others.	6 mos.	M.	27	5	"
25	Glands in right neck.	8-9 yrs.	F.	21	5	"
26	Glands in right neck.		F.	18	3	"
27	Enlarged submaxillary gland, left side.	2 wks.	F.	19	5	No reaction.
28	Glands in left neck and in left axilla.	2 yrs.	F.	20	3	Reaction.
29	Enlarged submaxillary gland, left side.	1 wk.	F.	35	3	No reaction.

1898.

TABLE II. GENERAL CASES. (1)

No.	Diagnosis.	Age.	Dose in mg.	Result.
1	Suppurating inguinal gland.	28	5	No reaction.
2	Suppurating inguinal gland.	34	5	" "
3	Suppurating inguinal gland, both sides.	33	5	" "
4	Suppurating inguinal gland, left side.		10	" "
5	Suppurating inguinal gland.	23	5	" "
6	Suppurating inguinal gland, right side.	42	10	Probable reaction.
7	Enlarged gland, r. axilla.	11	3	No reaction.
8	Enlarged glands, l. axilla.	40	3	Slight reaction.
9	Suspected tuberculous wrist, also complains of cough and says she has spit blood.	16	1	Reaction.
10	Indurated swelling of the right testicle, 1 month's duration; no known cause.	29	5	Reaction.
11	Indurated swelling of the left epididymis of 3 yr's duration.	24	5, 10	No reaction.
12	Swelling of right wrist, possibly tuberculosis.	26	8	Reaction.
13	Arthritis of carpometacarpal joint of r. thumb.	23	5	No reaction.
14	Old sprain of ankle.	21	5	" "
15	Necrosis of right thigh.	23 mos.	1	" "
16	Chronic laryngitis; specific.	26	10	Moderate reaction.
17	Atrophic rhinitis; pharyngitis sicca.	21	5	Reaction.
18	Atrophic rhinitis; pharyngitis sicca.	36	5	Moderate reaction.
19	Recent injury to side.	60	5	No reaction.
20	Abdominal ascites, 10 months.	19	5	Doubtful reaction.
21	Pulmonary tuberculosis, quite extensive consolidation; tubercle bacilli in sputum.	50	3, 5	No reaction.
22	Pulmonary tuberculosis, atrophic rhinitis; tubercle bacilli in sputum.	24	5, 10	No reaction.
23	Pulmonary tuberculosis, slight consolidation; tubercle bacilli in sputum.	24	5	Reaction.

(1) From the Medical News—July 9, 1898.

TABLE III.—CERVICAL ADENITIS.

No.	Condition.	Duration.	Sex	Age.	Dose in mg.	Result
1	Enlarged glands on both sides of the neck.	3 wks.	F.	3 yrs.	$\frac{1}{2}$ mg.	Slight reaction.
2	Suppurating gland in right neck. Possible previous syphilis.	2½ mos.	M.	24 yrs.	10 mg.	React'n [retarded 24 hrs]
3	Suppurating gland in left neck.	3 yrs.	F.	6 yrs.	2 mg.	No reaction.
4	Enlarged gland left neck.	2 mos.	M.	5 yrs.	1 mg.	No reaction.
5	Small gland at the left inferior maxillary angle.	6 wks.	F.	8 yrs.	2 mg.	Reaction, moderate, delayed 12 hrs.
6	Multiple glands in left neck, also a few small ones on r. side.	uncertain.	M.	9 yrs.	5 mg. T*	Slight reaction.
7	Enlarged glands in right neck, one fluctuating; has had them before.		F.	12 yrs.	10 mg. T.	Slight reaction.
8	Enlarged submaxillary gland in left neck.	10 mos.	F.	43 yrs.	8 mg. T.	Slight reaction.
9	Enlarged glands r. side.	1 wk.	F.	15 yrs.	5 mg. T.	Reaction.
10	Enlarged glands r. side.	3 wks.	M.	43 yrs.	10 mg. K ^o	Reaction.
11	Enlarged glands r. side.	3 wks.	F.	19 yrs.	5, 10 mg. K	No reaction.
12	Glands on both sides of neck.	1 yr.	M.	20 yrs.	10 mg. T	Reaction.
13	Glands in right neck.	1 mo.	F.	10 yrs.	5 mg.	Reaction.
14	Glands in left neck.	3 yrs.	F.	25 yrs.	8 mg.	Reaction.
15	Enlarged glands.	2 wks.	F.	3 yrs.	2 mg.	Slight reaction.
16	Sub-mental glands.	3 yrs.	F.	20 yrs.	10 mg. K.	Reaction.
17	Enlarged glands in post. triangle of neck, right side.	3 mos.	F.	30 yrs.	7 mg. K.	Reaction.
18	Bunch of glands in left neck.	2 wks.	F.	5 yrs.	3 mg. K.	
19	Suppurating glands in left neck.		M.	21 mos.	$\frac{1}{2}$, 1, 2 mg.	No reaction
20	Glands on both sides of neck.	9 mos.	F.	21 yrs.	5, 7 mg.	Reaction
21	Small suppurating gland in right neck.		F.	18 yrs.	5, 8 mg.	Reaction after 8 mg.
22	Glands in right neck.	3 wks.	F.	12 yrs.	3, 5 mg.	Slight reaction after 5 mg.
23	Superficial glands. scars of former ones.	2 mos.	F.	20 yrs.	5, 7 mg.	Reaction.
24	Glands in right neck.	2 yrs.	F.	40 yrs.	5 mg.	No reaction.
25	Small glands in neck.	2 yrs.	F.	8 yrs.	2 mg.	Reaction
26	Glands in right neck, some large	16 days.	M.	23 yrs.	7 mg.	Reaction.
27	Large mass of glands in the right neck.	2 mos.	M.	Adult	10 mg.	No reaction.

TABLE IV.—GENERAL CASES TUBERCULIN INJECTIONS.

No.	Diagnosis.	Age.	Dose in mg.	Result
1	Clinical and physical evidence of P. T. No T. B. in sputum.	11	7 mg. T.	Reaction.
2	Some clinical evidence of P. T. No T. B. in sputum.	17	5, 7 mg. K	No reaction.
3	Some clinical evidence of P. T.	30	7 mg. K.	No reaction.
4	Clinical evidence of P. T. No T. B. in sputum.	37	5 mg.	Reaction
4	Clinical evidence of P. T. Venereal sore 8 or 9 years ago.	25	8, 10 mg	Slight reaction.
6	Some clinical evidence of P. T. No T. B. in sputum.	29	8 mg.	No reaction.
7	Slight clinical evidence of P. T. No T. B. in sputum.	65	10 mg.	No reaction.
8	Slight clinical evidence of P. T.	12	3 mg.	Doubtful reaction.
9	Pulmonary tuberculosis 2d stage. T. B. in Sputum.	29	5, 10 mg.	Reaction from 10.
10	Pulmonary tuberculosis. T. B. in sputum.		5, 10 mg.	No reaction.
11	Pulmonary tuberculosis, chronic laryngitis. T. B. in sputum.	42	10, 12 mg.	No reaction.
11 a	Syphilis, adenitis in both sides of neck.	35	5, 10 mg.	Marked reaction after 10 mg Slight after 5 mg.
12	Syphilis.	30	7 mg K.	No reaction.
13	Syphilis.		7 mg K.	Reaction.
14	Syphilis.	16	5 mg K.	No reaction.
15	Syphilis.	48	12 mg. K.	No reaction.
16	Syphilis.	23	10 mg.	Reaction.
17	Syphilis.	22	10 mg.	No reaction.
18	Possible syphilis.	29	10 mg.	No reaction.
19	Enlarged ankylosed knee joint.	13	3, 5 mg K	No reaction.
20	Necrosis of pelvic bones.	24	10 T. 10 K.	Reaction.
21	Chronic swelling and pain in right knee, 8 mos. duration.	27	10 mg.	No reaction.
22	Abscess in right hip; enlarged inguinal glands	14	3 mg.	No reaction.
23	Cystic enlargement of right testicle. Pain and an ill-defined mass in left iliac region, from injury 1 year ago.	25	10 mg. T.	Reaction.
24	Enlarged, more or less acutely inflamed left elbow. Syphilis $\frac{1}{2}$ years ago.	23	12 mg T.	Reaction.
25	Enlarged thyroid gland, 7 or 8 mos. duration.	18	5 mg.	Reaction.
26	Chronic enlargement of the metacarpal bones of first and second finger of the left hand, 3 mos. duration.	37	5 mg.	Reaction.
27	Pleuritic effusion in right side 2 wks duration.	25	7 mg.	No reaction.
28	Cough, haemoptysis, subsequently initial. No sufficiency discovered.	32	7 mg.	No reaction
29	Pulmonary tuberculosis. T. B. in sputum.	24	7 mg	Moderate reaction.
30	Cough for several months. Purulent expectoration. No physical signs. No T. B. in sputum	18	7 mg.	No reaction.

*T.—Trudeau's Tuberculin. °K.—Koch's Tuberculin.

THE DIAGNOSIS OF EARLY PHTHISIS.

BY LLEWELLYN P. BARBOUR, M. D., BOULDER, COLORADO.

Can the early stages of Pulmonary Tuberculosis be diagnosed with reasonable certainty without diagnostic injections of tuberculin?

With reasonable certainty, yes.

And yet, in submitting this paper to the readers of the Journal of Tuberculosis, the writer wishes it understood distinctly that he is not an opponent of the diagnostic use of tuberculin. I do myself use it occasionally for that purpose; and have several times applied the test to myself. So it cannot be said that I do not take my own medicine. In the hands of expert and careful men tuberculin is safe. That it is an almost absolutely certain method of recognizing slight and obscure tuberculous deposits, which otherwise would be beyond our ken, is without question.

But that the diagnostic use of tuberculin is such a necessity as the writers in the last number of the Journal of Tuberculosis would have us believe, is, in my opinion, not true.

THE USE OF TUBERCULIN IS NOT OFTEN NECESSARY FOR THE EXPERT.—Very few cases of tuberculosis come into the hands of the physician before the disease has made advance sufficient for recognition by one who is a careful observer and a skilled diagnostician. An individual with an incipient pulmonary tuberculosis is usually in a fair degree of health. He often does not yet realize that he is not in perfect health. It is the sick who consult a physician. And in most cases of pulmonary tuberculosis it is only after "there is sufficient consolidation to produce dullness;" after "rales are present and tubercle bacilli are found in the scant expectoration" that the individual believes himself sick and consults his doctor. And whether or not we call this an early diagnosis, certainly no "golden opportunity" is lost so far as treatment with probability of recovery is concerned.

It is the earliest stage at which we can hope to receive many of our patients. It is a stage from which the great majority should recover; and it is a stage in which tuberculin is wholly unnecessary as a diagnostic measure.

Even in those cases in which there is as yet no breaking down of tubercles with expectoration, cases in which no bacilli are found, there are clinical symptoms sufficient to have called the patient's attention to his condition; and a thorough investigation of these symptoms, together with a careful physical exploration of the chest, will in nineteen cases out of twenty afford grounds on which a diagnosis of very probable certainty may be based.

THE EARLIEST PHYSICAL SIGNS.—A respiratory murmur of slightly higher pitch and of lessened intensity in the very earliest stage of deposit, with an increasing intensity and harshened quality as the deposit increases, a jerky or cog-wheel respiration, an abnormal transference of heart sounds, a slight dulness of the percussion note, increasing in dulness as the affection increases, pleuritic friction sounds and sometimes rales in a very limited area, either moist or dry,—these are physical signs that may often be detected before bacilli can be found.

These signs vary as to their value. It is true that areas of cog-wheel or jerky respiration may be due to other causes, but hardly “just as apt” to be so, as stated by Dr. Taylor. It is true, too, that a respiratory murmur of lessened intensity may be due to other causes.

Standing alone either symptom is worth something as an indication of tubercular infiltration—perhaps not much—but combined with other symptoms they are of considerable value. That there may be sufficient consolidation to produce dulness on percussion before there is breaking down of tubercles is beyond dispute. When dulness over a limited area is found, it, by itself, affords grounds for a diagnosis of reasonable certainty, excluding of course a few conditions very unusual or easily differentiated. Whether such a diagnosis should or should not be called “early” is, I suppose, like the attitudes of Quilp’s attendant imp, a question of taste. Again a pleuritic friction sound is practically always of tuberculous origin. Rales, it is true, are not often found in a truly early stage, but they do occur occasionally, and when found are an almost sure indication of tuberculous infiltration.

Sometimes these symptoms do not occur in sufficient number, or the major ones are too indistinct to justify a diagnosis of tuberculosis. Even in such cases we are usually helped to a conclusion of reasonable certainty by the family and personal history and clinical symptoms. While the tubercle bacilli are rarely transmitted directly to offspring, yet beyond a doubt certain families are more susceptible than others; and a history of a considerable number of cases of phthisis, scrofula, joint disease, chronic diarrhoea, chronic dyspepsia, alcoholism, &c., &c., increases the probability of phthisis. Von Ruck (1) in a recent article shows very clearly that a family history of much sickness, whether tubercular or not, increases the tendency to phthisis in the individual. So too, a personal history of much sickness of any kind increases the probability of phthisis, although a previous history of other tubercular diseases makes the presence of phthisis much more probable.

(1) The cause of Tuberculosis, and the conditions which predispose to its acquirement. *Journal of Tuberculosis* April, 1899, page 61.

But we must not err here. While a bad family and personal history increase the probability of phthisis they do not prove it; nor does the reverse exclude it. These things increase the probability of phthisis and are to be weighed with other evidence.

Age, too, is to be considered in reckoning probabilities, and occupation, surroundings, and opportunity of infection.

THE CLINICAL HISTORY of phthisis is very variable, and as much so in the early, as in later stages.

The symptoms differ much in value and no one symptom is invariably present, but there are not often lacking two or three out of the group to indicate their origin with reasonable certainty.

A cough, slight perhaps, and of insidious onset, sometimes persisting continually and sometimes ceasing for a time to reappear at intervals, is often the first symptom to attract the patient's attention; and is a good indication of phthisis; not positive, but very probable, so probable as to be almost positive when continued beyond two or three months. Haemoptysis is the next most frequent first warning; and is a symptom of more than reasonable certainty, provided other sources for the bleeding are excluded.

Pleuritic pains occurring about the upper part of the chest or beneath the scapula are quite significant of phthisis; and are often felt by the patient when the friction sound cannot be heard by the auscultator. Of course not all pains of the chest are of pleuritic origin.

THE TEMPERATURE.—Where it is necessary, a thermometer alone would enable us, in most cases, to reach a reasonably certain conclusion of phthisis at a much earlier stage than the disease is now usually recognized. There are exceptional cases in which the inflammatory reaction is so slight and the bacillary advance so slow, that no rise of temperature results until destruction and septic infection occur. Such cases are rare. The presence of tuberculous trouble is quite sure to cause some rise at times, especially after physical or mental worry. To diagnose with a thermometer, a temperature record, taken every two hours, is kept for ten or twelve days. Physical exercise to the point of fatigue is required two or three times during the record making; and at one or two other times severe mental exercise. A rise in temperature of one or two degrees following this exercise, even though normal at other times, is, other diseases excluded, a reliable indication of phthisis.

My first suspicion of phthisis in one case was caused by accidentally learning that a rise of temperature occurred whenever the patient played a game of chess. My suspicions were confirmed by further examination.

A rise of one or one and one-half degrees following hearty meals may often be found and is strongly indicative of phthisis. The digestive process does not cause such a rise in the healthy individual.

OTHER EVIDENCES.—Anorexia is significant of phthisis only when it occurs with other symptoms. Failure of digestion is of more importance. Indigestion especially of the fermentative form is a very frequent complication of incipient phthisis. More often than any other trouble it precedes phthisis. Repeated chilly sensations, flashes of heat, proneness to “take cold”—all these are symptoms which sometimes occur in early phthisis and are of some value in connection with other evidence. With malaria and decayed teeth excluded, a persistently coated tongue gives ground for a suspicion of phthisis.

While different symptoms have greatly differing value, while some, of themselves, have little weight, yet all should be considered; as all are of value in relation to other evidence. Some standing alone are of great importance: a long continued cough for instance, or a persistent slight rise of temperature, or a hemorrhage from the lungs, or a circumscribed pleurisy,—each of itself is almost sufficient for a diagnosis of reasonable certainty.

But the value of any symptom is greatly enhanced by confirming symptoms, and even minor ones may by their number become very conclusive. Many probabilities pointing to one conclusion have the force of positiveness. Thus by due diligence in investigating and by considering with judgment the total evidence as drawn from family and personal history, physical signs and clinical symptoms we will not often err in a diagnosis of early phthisis without use of tuberculin.

If in reply to the above it is said that, while the expert may reach conclusions of reasonable positiveness without the use of tuberculin, yet for the inexpert the tuberculin is a necessity if an early diagnosis is to be made; I would answer that for one inexpert in pulmonary work tuberculin is by no means so safe as implied by the writers. In my judgment the inexpert should not use the test at all until he has made himself perfectly familiar with its application. We do not win friends for tuberculin or for any of these products by ignoring their dangers. And tuberculin has dangers that can be avoided only by the expert and cautious. Even the skilled cannot always detect dormant tuberculous foci in distant parts of the body; and an injudicious dose may start these to activity and make them the source of much annoyance or of positive disaster. I do not need to fill space by citing authorities; the literature of the subject is full of warnings of dangers, many of which are real.

THE EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS.

BY CHAS. F. DENNY, M. D., OF ST. PAUL, MINN.

This disease is known through the labors of Koch and others to be due to the implantation in the body of a specific germ called the tubercle bacillus. It existed ages ago and has always appeared in many forms. Scrofula or the Kings' Evil of old times was nothing more or less than glandular tuberculosis. Once having found a foot-hold in the body it does one of two things, either finds the soil so good that it rapidly involves the whole system, or it remains local or latent until a favorable moment occurs when it asserts itself in a more active manner.

These facts should lead us to consider the necessity for its earliest detection in order that we may successfully cope with the disease. We meet with it in three classes or types of cases, viz.: cases which can be cured, cases which can be arrested or held in check for variable periods, and cases that are incurable.

Viewing it in this light all our efforts should be made towards its early detection; for in that, and that alone lies whatever real success we attain in its treatment. We should never fail to call all aids to our support and many ordinarily obscure affections may with care be traced to tuberculosis.

As has been stated before, a good soil will propagate the trouble. A good soil means a system naturally so weak that it cannot resist the inroads of the disease. It has not the vitality to kill off the bacillus when it gains entrance to the economy, hence it grows, it multiplies, and ultimately wrecks the body to which it has gained access.

Here is where the hereditary influences come in play. A person born of a tuberculous mother and father has very little resisting power and the disease is usually engrafted in early life. A long line of tuberculous ancestors invariably produces constitutions prone to receive and propagate tuberculosis. Again we see decided tendencies in families to resemble one parent or the other. Some children tend in characteristics toward the paternal and others towards the maternal side, and whatever the weaknesses of those they resemble most, they are the ones most likely to develop in them.

This is often seen in the form of headaches, neuralgias, rheumatic conditions, digestive disorders and tendencies toward minor troubles which more robust individuals escape. Over children of weak constitutions we should ever have a watchful eye; and every means should be used to build up their tissue to withstand the inroads of disease. Such constitutionally weak children are prone to develop a tubercular dis-

order. They present a soil of rich character for the growth of the bacillus. In some cases we find the glands showing the first signs of the trouble especially the submaxillary and cervical chain; in others digestive disturbances, diarrhoeal discharges, and attacks of peritonitis and mesenteric glandular enlargements are present and the latter may often be felt through the abdominal wall; in still others the joints, especially the hip and knee and ankle, all are seats of a tubercular attack; or the nose, larynx, bronchi are the first parts to show tubercular lesions; more rarely the lung itself is the starting focus for its dissemination.

How then can we detect this disease early enough to be of material assistance to a patient?

This is at times difficult; but by a careful study of each case that presents itself the difficulty can usually be cleared away and many a victim saved from a slow death. Far too many apparently minor ailments recurring in different individuals are not sufficiently studied to determine their true source. The tubercle bacillus is the cause of many digestive derangements that are passed by the hasty physician under the name of biliousness, dyspepsia, intestinal catarrh, etc. Many a so-called simple cold is the beginning of a tubercular lung disease. Joints are treated for rheumatism time and again when tuberculosis is the real cause.

In some instances this may be due to ignorance, but in many more to careless study of the cases on the part of the medical attendant. We have means at our hands for the early detection of the disease and it is the duty of every physician to be on the alert to detect it. Some of the earlier signs of tuberculosis are well worthy of a careful investigation and an enumeration of them in a paper of this kind is not out of place. The subject is too vast a one to attempt to cover the whole field, and chronic pulmonary tuberculosis in its earlier clinical aspects is what will be chiefly mentioned.

The observant physician, even without the sputum examination or a tuberculin test will see in these cases signs of warning which in time will be verified by finding the bacillus itself. The bright color of the cheeks, the glistening eye, and slight hacking but infrequent cough are signs of warning. The tonsils should be examined to see if they are the cause of this cough, also an elongated uvula should be taken into consideration. Failing to find cause in these directions a hacking cough is a sign of much importance and directs our attention to the lung itself and to the upper air passages.

There is another indication which is well worth study and that is

the temperature; to be of value, a continuous observation should be had for a considerable period, a record being kept of the morning and evening register. If tuberculosis is present these cases will almost invariably show a slight rise at night, varying from 99° to 100° F. and a normal or subnormal range in the morning. Occasionally remissions are seen at night; but a careful observation will eventually show that the body temperature is disturbed on an average. These patients become so habituated to this that they claim to be feeling perfectly well. Again slight "night sweats" may be admitted on questioning these patients, that they never thought of as a sign of ill health. I repeat again, these symptoms when not satisfactorily accounted for by other conditions are an almost positive indication of tubercular processes in the body. It is of great advantage to recognize these early symptoms since they can be found long before the patient expectorates and the sputum shows the bacillus.

A searching chest examination now, will often reward our efforts by showing variations in the character of the breathing, and slight, almost imperceptible differences in the percussion sounds in the favorite localities for the beginning of the disease. Slightly dull areas at the apices or in the sub-clavicular region or along the vertebral borders of the scapulae with varying respiratory murmurs with or without fine rales, are only stronger proofs of what we are dealing with.

Again the signs of circumscribed bronchial catarrh found with other objective symptoms render our diagnosis nearly certain. We may be called to a case of pleurisy of subacute type with effusion; paracentesis gives us a fibrinous fluid of a greenish tinge—it is highly suspicious especially when the pleurisy begins abruptly; a bloody exudate from a pericardial sac is another suspicious sign of tubercular disease. If we stop a moment and reflect that one-seventh of the mortality of the world is due to tuberculosis and at that conservative estimate, in this country alone 150,000 deaths per year are due to this disease, the importance of its early detection is forced upon us.

The pulse often gives a hint as to constitutional weaknesses, dependent on a tubercular cause. The weak, soft, rapid, and often intermittent pulse in women whose color indicates anaemia is frequently connected with a tubercular diathesis. Tubercular patients prone to anaemia and weak hearts with so-called anaemic murmurs without any actual organic disease are frequently met with. It is not any one symptom alone but a grouping together of all or of a number of individual symptoms that confirms our opinion.

Valuable as the finding of the bacillus in the sputum is, as a sure

sign of tuberculosis, the fact should never be lost sight of that it is not an early sign, the germ is there and at work long before sputum is present, and there are cases in which repeated examinations fail to find the bacillus in the expectoration, and yet later tuberculosis is shown after death by the autopsy.

Of late the X rays have been used for searching out areas of consolidation in the lungs and long before this condition can be ascertained by the usual physical signs certain abnormalities in the lung may be observed with the fluorescent screen indicating their existence. It is also claimed that prolonged expiration may be observed by means of the fluoroscope. Dr. Francis H. Williams of Boston has given this subject much study and reports several cases examined in this way (1). Thus it seems that still another means for early diagnosis is offered us in the future, which, however, can never fully supercede the more common diagnostic methods.

The tuberculin test is also able to clear up cases where doubt is felt as to the nature of the trouble, and has its proper applications.

If the contents of this paper will draw attention to the practical side of the subject and further a more painstaking study of this class of cases by the general practitioner its aims will have been attained.

THE DIAGNOSIS OF JOINT TUBERCULOSIS.

BY DR. JAMES K. YOUNG, PHILADELPHIA, PA.

The importance of making a correct diagnosis in cases of joint tuberculosis is evinced by the large number of such cases occurring in surgical practice. In estimating the relative frequency of joint tuberculosis some years ago, for another purpose, the writer found that nearly thirty-one per cent. of all cases of joint disease applying at a dispensary for special orthopedic diseases, were cases of joint tuberculosis. In fact, the great frequency of cases of joint tuberculosis has led at the present time to classifying almost all cases of chronic joint diseases as cases of tuberculosis. Dr. J. Collins Warren in discussing the subject of tuberculosis of bones and joints, at the last meeting of the American Orthopedic Association, (2) referred to a demonstration given some thirty years ago by Professor Sayre, during a lecture of Professor Gross's, in which he demonstrated the tuberculous diseases of the bone. While Professor Gross

(1) Boston Med. & Surg. Journal, June 1, '99.

(2) Am. Ortho. Assoc., vol. XI, p. 406.

did not agree with the speaker on this occasion he professed a great admiration for Dr. Sayre, and proposed to let the students have the privilege of listening to his views on this subject. At the present time the pendulum of opinion has swung to the other extreme, and the profession is in danger of attributing all chronic diseases of the joint to tuberculosis.

The early diagnosis of tuberculous diseases of the joints is most important, because it is at this early period that most can be accomplished by medical and surgical treatment. In considering the early diagnosis of joint tuberculosis it is well to consider, in connection with the cause of the disease, not only the age of the epiphysis entering into the formation of the joint, the needs and the apparance of the nutrient artery supplying this part, but also the effect of superincumbent weight upon the part, the important question of heredity, together with the occurrence of traumatism as a causative factor.

Attention has already been called by the writer to each of these subjects (1) and they need not be considered in detail here; suffice it to say that heredity plays, in almost all these cases, an important factor; and it is particularly interesting to observe that frequently children are affected by tuberculous diseases of the joint from a tuberculous father, the mother apparently being in perfect health, or having only a slight degree of anaemia. The most frequent disease with which this affection is confused, in the early period, is rheumatism of the joint, particularly in young children.

Rheumatism of single joints is an exceedingly rare disease in children, and most of such cases, which are diagnosed as rheumatism of the joints, afterward fall into the hands of specialists to be treated as tuberculosis. If there is no other symptom of rheumatism present in the individual the patient should be carefully examined for tuberculous joint disease, because in the majority of cases it will be found to be of this character.

The two symptoms which are most positive of joint tuberculosis are spasms and atrophy: the spasm of the muscles which accompanies this affection is tetanic in character, and occurs very early in the disease. Its presence is followed soon by atrophy, or wasting of the muscles, and these two symptoms are always present in tuberculous joint affections, no matter which joint may be the seat of the disease. The spasm of the muscles occurs in connection with every joint in the body affected by

(1) Phila. Poly. Clinic, vol. V, Feb'y, 1896.

tubercular disease. In spine disease, particularly in the lumbar region, it is one of the earliest symptoms which occurs and often before the occurrence of deformity, spasm of the Psoas and Iliacus may sometimes be detected. In hip disease the adductors are among the first, and at the knee joint the ham string tendons may frequently be found to be contracted at a very early stage of this affection. The joint disease which, at the present time, is most frequently confounded with tuberculous diseases is specific or syphilitic disease. Cases of this kind not infrequently pass through the hand of very good practitioners, having been treated for tuberculous diseases without any benefit, and are afterward promptly cured by treating them for the disease which is present. The differential diagnosis of this affection of the joint is so important that I have tabulated the differential diagnosis from chronic synovitis, chronic articular arthritis, and syphilitic arthritis.

NON-TUBERCULAR CHRONIC SYNOVITIS.	TUBERCULAR CHRONIC ARTICULAR AR- THRITIS.	SPECIFIC SYPHILITIC ARTHRITIS.
1. Marked effusion, capsule thickened.	1. No fluctuation capsule not thickened.	1. Slight effusion, capsule thickened.
2. Joint outline enlarged and obliterated.	2. Joint outline distinct and clear.	2. Joint outline distinct, enlarged and indurated.
3. Motion nearly normal.	3. Motion limited.	3. Motion limited.
4. Reflex muscular spasm absent.	4. Reflex muscular spasm present.	4. Reflex muscular spasm absent
5. No atrophy.	5. Marked atrophy.	5. Atrophy slight.
6. Pain absent.	6. Pain acute upon motion.	6. Pain moderate upon motion.
7. Night cries absent.	7. Night cries present.	7. Night cries absent.

With a history of the diathesis present in the patient, from the chart above a diagnosis may, in most cases be made. If there is any doubt in regard to the nature of the affection the use of constitutional remedies, large doses of iodide of potassium, together with the use of mercurial ointment locally, will, in a short time render the diagnosis clear.

A very important means of diagnosis is now in our possession in the use of the Roentgen Ray photography. In cases of advanced tuberculosis a positive diagnosis can frequently be made by the use of the X Ray photographs. The appearance of the cartilages and bones is irregular and roughened, a condition easily distinguished from the clear and distinct outline furnished by similar photographs in cases of chronic synovitis. In specific arthritis deposits of fibrous tissue may sometimes be detected by means of X Ray photography. These will obscure the normal outline of the joint, and there will not be the roughened, irregular, and

worm-eaten appearance of tuberculous disease. In examining the pictures taken by the Roentgen Rays it is best to hold them to the light and look through them from behind, in this way obtaining a view of the part as it appears in its natural position. A picture should also be taken of the sound joint on the opposite side, in exactly the same position as the picture of the diseased part.

The occurrence of abscesses in tuberculous disease is often of diagnostic value, particularly as their origin and course are very typical in many cases. From the origin and course of the abscesses (1) the exact location of the primary focus of the disease may frequently be determined. The examination of the pus escaping from sinuses connected with tuberculous abscesses is usually negative, and very little assistance is added in making a diagnosis by examining the pus. The examination of portions removed during operations frequently reveals the presence of the bacilli of tuberculosis. Examination of the blood in cases of suspected tuberculosis of the joints is of considerable value, as marked anaemia or leucocytosis is frequently a forerunner of a tuberculous outbreak in a joint.

In conclusion, the most important symptoms for the early diagnosis of tuberculous diseases of the joints will be found in the spasm and atrophy which accompany this condition.

REPORT OF TWELVE CASES OF TUBERCULOSIS, TREATED WITH WATERY EXTRACT OF TUBERCLE BACILLI.

BY J. SUTHERLAND, M. D., C. M., SPOKANE, WASH.

In these days of scientific research when large numbers of new remedies are being discovered and put upon the market, when a great mass of literature is being published, much of it of a purely advertising nature and a great deal of it quite unreliable, it is a difficult matter indeed for the busy practitioner to sift the good from the bad and keep himself always in touch with those remedies that have real merit in the treatment of disease; and there is certainly much excuse for the conservatism which causes him to adhere to the use of the older standard remedies with indifferent success, or even failure rather than employ newer ones.

This is perhaps more true in the treatment of tuberculosis than in any other disease which engages the physician's attention.

The appearance nearly a decade ago of Koch's tuberculin which was

(1) Young's Orthopedic Surgery, pages 36 and 80.

heralded as a specific for tuberculosis aroused perhaps greater and more world-wide interest than any other medical discovery of the century, but the disappointment following its use, and more often its abuse, caused so violent a reaction, that the merits it really possessed were not only almost lost sight of, but a great majority of the profession has since then been slow to adopt anything of a similar nature for the treatment of that disease.

The discovery opened up, however, a broad field for research and a few eminent physicians and scientists taking advantage of this have labored earnestly in the hope that a remedy at once safe and effective might be produced that could be relied upon as a cure for tuberculosis in its early stages; for it seems too much to hope that the time will ever come when those in whom the disease has made extensive ravages can be restored to health by the aid of any remedy.

The results of their labors are after all most encouraging and we are led to hope that still greater success is soon to follow.

Among the remedies that have been produced is one that I believe to possess undoubted merits, which clearly entitle it to the attention of the profession, namely the Watery Extract of Tubercle Bacilli prepared by Dr. von Ruck, of Asheville, N. C. My experience with the use of this Watery Extract extends over the past eighteen months. The first six months of this time I spent at the Winyah Sanitarium, at Asheville, where I had the opportunity of observing its use by Dr. von Ruck upon a large number of cases of tuberculosis with most gratifying results. The remedy had then been in use but a short time, but its efficiency and its safety had been well established by extensive experiments upon Guinea-pigs, and its good effects upon properly selected cases, was a matter of daily observation.

For the past year I have used it in my own practice upon a number of cases of the disease, and I shall give below a report of all except those, who have but recently come under treatment. Unfortunately some of the cases have not been such as I would consider a fair test for the remedy used, as they were in a far advanced stage of the disease and little encouragement was given them at the time treatment was begun, that any benefit would likely follow.

It has been my experience that a majority of those who apply for treatment are in an advanced stage of the disease, many so reduced that there is no hope of relief. This class of patients I have usually refused and have sent them back to their physicians with the assurance that they could receive as much benefit at home as I could possibly render them,

but in a few instances I have allowed myself to be prevailed upon to treat what appeared to me hopeless cases and in but one instance with a happier result than I had anticipated.

However my experience has been unfavorable in all advanced cases; for though temporary improvement has followed the treatment, I know not whether to attribute this to the use of the specific treatment or to the rest, attention to diet and hygiene, and the general care of the patient which I am always careful to enforce, but I am inclined to believe it was due almost entirely to the latter cause.

In the early stage cases and those in which the destruction of lung tissue was not extensive the results have been such as to justify me in believing that much of the improvement was due to the use of the Watery Extract, for no other remedies have been given to these patients except such as were necessary for special conditions arising during the course of treatment. Formerly I have used creosote, guaiacol carbonate, and the various other remedies employed in the treatment of tuberculosis, but have yet to report a single instance in my practice where there has been an apparent cure, on the contrary with the exception perhaps of an occasional temporary improvement the disease has continued to advance towards a fatal issue.

On the other hand by the use of the Watery Extract I have had in the past year five cases in which the lungs showed unmistakable evidence of tuberculosis, in four of which tubercle bacilli were found in the sputum with the accompanying symptoms of the disease, that have made an apparent recovery. In the fifth case there were cough, slight expectoration, evidence of deposit in the left apex, afternoon rise of temperature, loss of weight, general weakness and a vigorous reaction of 2° rise in temperature, following the tuberculin test. Whether these cures will prove permanent or not time alone will tell, but permanent or temporary the improvement has certainly been unprecedented and sufficiently marked that I feel justified in employing Watery Extract to the exclusion of the many other remedies I had formerly employed with so small a measure of success.

Another thing that has appeared very gratifying to me in connection with the treatment of these cases has been that they have, with one exception, shown this improvement during the fall and winter months in a northern climate, where an unusual amount of bad weather has prevailed and the temperature has for many days ranged from zero to 20° below. The altitude of Spokane is about 1,950 feet, the average annual rainfall 19 to 20 inches.

It has been the custom of many, in fact of the majority of local physicians, when they discovered tuberculosis in their patients, to send them to a southern climate in the hope that they may be benefited or may recover, but unfortunately this latter happy result is obtained in but a very small minority of even the early cases of tuberculosis.

Physicians too seldom realize what it means to a patient to be sent away from the comforts of home and the companionship of friends to a place where often all the comforts of life are wanting, and where climate is about all the unfortunate patient gets. How frequently patients are sent away with no other instructions as to how to take care of themselves than to "take plenty of exercise in the open air and eat nourishing food!" With this they are sent out to battle against disease in a climate where all the conditions are totally different from anything they have before experienced, and are expected to return in a few months well and strong.

I want to impress upon these members of the profession that climate is not a specific for tuberculosis in any stage, though a suitable climate, where one is not exposed to sudden and severe changes and where the atmosphere is moderately dry is a valuable aid in the general treatment of the disease. Plenty of fresh air and health-giving sunlight are always the best of restoratives, but without wholesome food, properly regulated exercise well tempered with rest, thorough care of the body with reference to the action of the skin, bowels, etc., and painstaking professional supervision, little good will be accomplished by climate alone.

Too often patients are sent from a low altitude to a high one and are instructed to exercise, the physician quite forgetting that such a change of conditions rather needs rest and quiet instead. Patients should at all times be encouraged to remain in the open air as much as possible so long as this can be done without exposure to great extremes of heat and cold and to wind and dust, but at the same time over exertion and the resulting fatigue are often more damaging than sedentary habits or indoor life.

We should always consider the pathology of the disease we are attempting to remedy, and remember that the heart's action is already increased in its effort to overcome the resistance to the circulation through the diseased portions of the lung. In every other disease where the heart's action is increased we advise rest, why then should we advise exercise in this disease alone? But we are told that this patient and that one improved while exercising freely. True, some have, but are they

not cases of *POST HOC ERGO PROPTER HOC*? What observations I have been able to make in the treatment of tuberculosis lead me to believe the improvement has been rather in spite of, than on account of the excessive exercise.

The benefit obtainable from any of the warm southerly climes seems to be due almost entirely to the fact, that the warmth of the air permits the patient to live an outdoor life during the greater part of the winter season thus enabling him to have an abundance of pure air at all times. But the observations I was able to make during seven months spent in the health resorts in Arizona, New Mexico, and North Carolina convince me that a patient's chances of recovery are better even in a northern climate with wholesome food, pleasant surroundings and the comforts of home than "roughing it" as so many do, both in the towns and country districts of the arid regions of the South.

Vast numbers of patients who are sent to these places are imbued with the idea that the climate is a specific for their disease and that they can neglect everything else, often committing all kinds of indiscretions thereby lessening their chances of recovery. Others perhaps on account of the expense are unable to obtain proper food or for the sake of economy go to cheap boarding houses where the fare could not be endured by strong healthy people, much less by those with poor appetites and disordered digestion, while a dozen or more patients in the various stages of the disease are at times associated together at the same table where obviously the conditions will not only often prove most depressing to many but their carelessness will tend also to the spread of infection. My experience in sending patients to these resorts has on the whole been very disappointing.

In this connection I wish to refer to the excellent results obtained by the use of the specific treatment by Dr. Aug. C. Kinney of Astoria, Oregon, with an elevation but a few feet above sea level where the annual rainfall is about as great as anywhere upon the American continent; results that convince me that with proper care and treatment success may be obtained by the careful physician in almost any climate and altitude.

Another matter I would like to impress very forcibly upon many members of the profession is the necessity of an earlier diagnosis of tuberculosis than is usually made. While admitting the difficulties in the way of detecting an early deposit of tubercle in the lung, I believe by acquirement of reasonable skill in diagnosis and exercise of proper care in weighing all the symptoms subjective and objective, the majority

of physicians would be enabled to discover the existence of the disease much earlier than they do at present.

Physical examination of the chest is a thing too often neglected by physicians and I have sometimes been astonished at the gross lesions that I have found to exist in the lungs of a patient who has told me that such a physician had examined his lungs and could find nothing wrong. From what I have been able to observe of the work of many physicians I believe that the majority are better skilled in almost every other department of their work than in this one. I know practitioners, excellent men in other things, who almost totally neglect the exploration of the chest and wait for the appearance of bacilli in the sputum to determine the diagnosis. This is all wrong, and when we consider that the earlier the real disease and its extent are determined, the better are the prospects of its arrest and ultimate cure, we should do all in our power to rectify this error and to become proficient in the early discovery of the disease.

In early and obscure cases we are all liable to mistakes, but I had rather err on the safe side and treat a milder disease for the severer one, than to imperil the patient's chances of recovery by my neglect. The tuberculin test I believe is a safe and most valuable aid in the early diagnosis of tuberculosis, especially in obscure cases and my experience with its use though comprising less than a dozen cases, convinces me that it should be employed whenever the diagnosis is in doubt, and if no characteristic febrile reaction occurs it is safe to conclude that no tuberculosis exists. In the cases in which I have employed the test I have found that more marked reactions occur where there is lymphatic involvement than in cases where the lung tissue appears to be the chief seat of the disease.

My first experience with the use of Watery Extract was upon myself under the direction of Dr. von Ruck. After a very trying winter's work in attending to the duties of my profession I developed pulmonary tuberculosis in the summer of '97. The cough at no time was severe, but symptoms of asthma accompanied it. The earliest symptoms were referred to my stomach, indigestion being at times marked. I tired easily and rapid walking increased my pulse rate to 110 to 115 per minute. There was slight afternoon rise of temperature seldom exceeding one degree. Appetite was poor and my weight was ten pounds below normal. This condition continued for three months when I began to expectorate a little in the morning and sometimes following meals. After repeated negative examinations of this expectoration I at last found large numbers of tubercle bacilli, one specimen examined by Dr. A. E. Mackay of

Portland, Oregon, appearing like a pure culture so numerous were they. After spending some time in New Mexico I concluded to use the specific treatment and for this purpose went to Asheville. Treatment was commenced with tuberculinum purificatum which at first produced marked reactions in small doses. Later a change was made to Watery Extract, small doses of which were at first followed by mild reactions. This was used in gradually increasing doses care being taken as far as possible to avoid reactions. I finally used at a single dose 100 c. c. (equal to 1 c. c. of solution No. 100) of the Watery Extract without reaction, though my experience since with the remedy has caused me to doubt the necessity of such large doses, and I am inclined to believe that as great good can be accomplished by doses not to exceed one-third of this amount.

I left Asheville after five months treatment with a normal pulse and temperature, no cough or expectoration, normal weight, in better health than I had enjoyed for several years, and have remained so during the past year in spite of the fact that I have attended continuously to my practice during that time. I also contracted two severe colds during the past winter, each lasting a couple of weeks, but examination of the expectoration accompanying them showed no return of the tubercle bacilli. With this result upon myself, and with equally encouraging results observed in Dr. von Ruek's patients as well as in the cases recorded below, I can perhaps be pardoned if I am rather enthusiastic over the merits of the Watery Extract in the treatment of this disease.

One question in regard to the use of the specific products which I have as yet been unable to determine to my satisfaction is whether the administration should be continuous, or interrupted in order to give the system a rest and time in which to eliminate the accumulated products, I am somewhat inclined to favor the latter method as being more effective and at the same time less expensive for the patient which is often a matter of great importance. I have noticed in some cases that after continuous use of the remedy for two, three or four months the improvement has not been so rapid as it was at the beginning. I have dropped its use for a month and have found that the patient not only did better in the interval but appeared to improve more rapidly under smaller doses upon resuming its use. The system appears to grow accustomed to, or in other words to develop a tolerance for, its use, much as it will to the continuous use of alcohol or tobacco. This can be overcome by the interrupted method and at the same time I am convinced at least equally as good results can be obtained with a smaller amount of the remedy used.

I do not wish to be understood as advocating Watery Extract as a

specific for tuberculosis in every stage. On the contrary I look upon it as only directly specific upon living tubercular tissues and as a valuable aid to the other treatment employed. The more careful the attention given to every detail of treatment the more marked will be the improvement; and if Watery Extract alone is used to the exclusion or neglect of other things I would not expect as good results.

The only other remedies that I employ are such as I deem necessary for special conditions that arise during the course of the disease. The three things which most often have to be combatted are cough, night-sweats and anaemia.

COUGH.—If the proper rest is taken the majority of cases will require no remedies for cough. If this does not suffice I employ codeine in small doses as less inclined to disturb the digestion than morphine. Opium or its liquid preparation should never be employed except where diarrhoea exists with the cough. Where the cough is severe and dry, hot air inhalations are often of great benefit producing free expectoration and enabling the patient to rest. I have also seen cases where simply drinking a glass of hot water would do much towards relieving a spasm of coughing. All expectorants should be studiously avoided as in the majority of cases they do positive harm.

NIGHT-SWEATS.—Occasionally these are stubborn of control, but this is in but a small proportion even of advanced cases. I now seldom meet with a case that will not yield to simple rest and the use of the Watery Extract. I have not had a single case where this has been used, (though some cases were far advanced,) in which the night-sweats were not entirely under control in less than one week after commencing the treatment. If these measures should fail the best remedy, and the one I have formerly found most certain in its action is Atropia Sulphate in doses of 1-150 gr. to 1-50 gr. Small doses of codeine with aromatic sulphuric acid often act well in controlling sweats. Sponging with tepid water acidulated with acetic acid (one drachm of the strong acid to the pint) I have also found useful before I adopted my present methods of treatment.

ANAEMIA.—The first essential for the removal of anaemia is to see that the patient has a good supply of nutritious diet which he can easily digest and assimilate, care being taken to avoid those articles of food which disagree. The animal foods are especially necessary, fresh meat, butter, cream, milk and fats being particularly indicated, and care should be taken in the preparation of such things as will tempt the appetite. Cream usually agrees with patients and I always advise that it be

taken freely, instead of prescribing cod liver oil which I formerly used with so little benefit and so much discomfort and annoyance to my patients that I have since discarded its use almost entirely. Indigestible foods and late meals must be avoided as they are liable to produce cough, fever and diarrhoea.

For the medicinal treatment of the anaemia iron in its most assimilable form should be employed, and my recent experiences with Gude's Pepto-Mangan and Wyeth's Peptonate of Iron and Manganese convince me that these are admirable forms in which to administer this remedy. I have treated with Watery Extract but one case who has used stimulants habitually, but moderately, and his progress has been less favorable than I had reason to expect from the amount of lung involvement, and much less satisfactory than I observed in a number of others in whom the disease was more extensive, but who were not permitted to use stimulants.

Careful attention should be given to the skin. I require the stronger patients to take and the weaker ones to be given a sponge bath followed by smart friction every morning. These baths should be tempered according to the patient's condition from tepid to cold. The bowels should be kept regular and diarrhoea controlled if possible by the regulation of diet rather than by the use of medicines, though these at times be one necessary, and then should always be chosen with a view of avoiding as far as possible those that impair digestion or disturb the stomach.

Exercise should be moderate and adapted to the strength and condition of the patient. Where the temperature reaches 100° or more in the afternoons or where the pulse is high, quiet should be insisted upon and what exercise is taken should be in the forenoon before the temperature has risen. But patients should be encouraged to remain as much as possible in the open air when the weather is suitable. This is best accomplished at special institutions for the treatment of tuberculosis, but much can be done towards this end in private practice. Sleeping rooms should always be thoroughly ventilated and kept as far as possible at an even temperature during the winter season.

Lack of space forbids my going further into the treatment except to say that in early stage cases, and in the more advanced ones when the disease has become quiescent, I make use of the pneumatic cabinet to encourage deep inhalation which aids greatly in increasing the lung capacity by opening up the diseased or collapsed air cells, and which favors a better circulation. I have had a number of my patients use Denison's In-and Exhaler for like purposes and with apparently excellent effect.

The following is a report of the cases treated:

CASE I. Female, single, aged 24, consulted me first for a hacking cough in June, 1897, when the expectoration was slight, muco-purulent and contained a few tubercle bacilli. She spent the summer in the mountains returning much improved in health, but by October a slight cough had returned and bacilli were still present in expectoration which was not more than a few drachms daily. Did not see her again until June '99. In the meantime she had taken excellent care of herself and used guaiacol carbonate 30 grs. per day. Her temperature was 99°, pulse 80, cough moderate, expectoration half an ounce daily, muco-purulent, weight 114 pounds, feeling of weakness and depression, appetite poor, gradual loss of weight, and anaemia. The right apex showed distinct dullness on percussion, increased voice sound and prolonged expiration but no rales. Family history good except that her only sister, aged 21, died of tuberculosis the previous March.

Result : After three months treatment with watery extract, no cough, no expectoration, strength restored, weight 130 pounds, a gain of 16 pounds, lung clear, apical dullness gone, temperature 98.2-4, pulse 70; apparently recovered. No other treatment was given. Treatment was stopped eight months ago and she remains in excellent health.

CASE II. Female, aged 17. Had severe attack of typhoid fever from February to June, 1897. Prior to this time had been in excellent health. A year later began to cough and fall off in weight. Came under treatment in January, '99. At that time cough was severe, expectoration one ounce daily, muco-purulent, shortness of breath on exertion, occasional diarrhœa, pulse 100, temperature 99°. Examination showed chest expansion of but 1½ inches, relative dullness over right upper lobe to third rib, prolonged blowing expiration and exaggerated voice sounds over this area. Tubercle bacilli present in small numbers in sputum, weight 116 pounds.

Family history : Father has epilepsy. Two sisters died of typhoid fever. Two paternal aunts died of tuberculosis.

Result : After four and one half months treatment with watery extract; no cough, no expectoration, temperature 98.4°, pulse 85, no dullness, vesicular murmur clear, chest expansion three inches, weight 129.5 pounds, gain 13.5 pounds, in excellent health, apparent recovery.

CASE III. Female, aged 45, married, five children, mother and two brothers died of tuberculosis. Nursed mother for some months two years ago prior to her death. Has had occasional attacks of asthma for several years. Colds hard to get rid of. Consulted me in July, 1898, at which time pulse was 90, temperature 100° and weight 110 pounds. Cough severe, expectoration one ounce, muco-purulent, bacilli found in sputum. Area involved middle and lower lobes of right lung anteriorly, pleuritic friction at axillary line. Severe pleuritic pains at times. After four months' treatment she took la grippe and was confined to her bed three weeks, with dry pleurisy, temperature reaching 102° F., cough severe, small area in axillary space showed moist rales on deep inspiration. Treatment was continued during this attack with watery extract in decreased doses. Treatment stopped in April.

Result after eight months' treatment : Occasional slight cough on exertion, but no expectoration, temperature 98.6°, pulse 78, weight 122 pounds, gained 12 pounds, chest expansion increased one inch, respiratory murmur clear, but there is still slight pleuritic friction in right axillary space, but no longer any pain. Apparent recovery.

CASE IV. Male, aged 29, machinist. Consulted me first on January 24th last, cough was severe and expectoration moderate, mucus.

Trouble began with pneumonia in December, '96, from which recovery was very

slow and cough and night sweats continued until he came West the following September, when improvement followed and sweats disappeared. Had light attack of typhoid in December, 1898, and following this night sweats returned and cough increased. I found pulse of 90 and temperature 100°. Exploration showed infiltration of both apices especially the right one near the second costo-sternal articulation where the dullness was marked and the expiration harsh, prolonged and blowing in character. Few bacilli found in sputum. Weight 168 pounds. Family history good.

Result after three and one-half months' treatment: no cough, no expectoration, breathing greatly improved, still relative dullness over right apex below clavicle, pulse 66, temperature 98.4°. Weight remained same. Apparent recovery.

CASE V. Male, aged 39, foreman in lumber yard. Mother died of tuberculosis; otherwise history good.

Took cold in October last, which he was unable to get rid of. Consulted me on January 24, when he complained of severe cough in mornings and at times during the night. Expectoration scanty and muco-purulent. Voice hoarse and some swelling of the vocal cords. Temperature was 99.4° and pulse 90. No bacilli were found in sputum but there was a reaction two degrees following tuberculin test. Exploration of lungs showed dullness of left apex with slight crackling on inspiration. Weight, 155 pounds.

Result after two and one-half months' treatment: no cough, no expectoration, voice clear, vocal cords natural, temperature 98.4°, pulse 64, the vesicular murmur over left apex clear, no dullness, no crackling on inspiration. Weight 168 pounds, a gain of 13 pounds. Apparent recovery.

CASE VI. Male, aged 36, clergyman. No severe illness since childhood. Mother living, father died of heart disease. Two brothers, one sister and two nieces died of pulmonary tuberculosis, and one brother now has it in a far advanced stage.

Was called in consultation to the patient January 13, last. Cough was severe and hacking, no expectoration. Patient was quite anaemic, was falling off in weight, temperature 99.6°, pulse 84, weight 164 pounds. Tuberculin test produced temperature of 101°.

Base of both lower lobes showed decided evidence of infiltration with crackling rales on deep inspiration, prolonged expiration and dullness on percussion with increased voice sounds. Severe pains especially in left side.

Result after four months' treatment: cough greatly improved, temperature 98.4°, pulse 74, feels and looks much better, is able to attend to his work. Weight 172 pounds, a gain of eight pounds. Pain is greatly reduced and is now rarely felt. This case is greatly improved though there is still dullness over bases of lungs and some crackling rales remain on deep inspiration. (Gude's peptomangan was given to this patient for anaemia for some time after commencing treatment.)

CASE VII. Male, aged 34, attorney at law. One sister had tubercular necrosis of tibia lasting several years with final recovery after operation. Otherwise family record good. Had severe pneumonia of right lung in spring of 1886 followed by very slow recovery. Never was so strong afterwards, though appeared to recover perfectly. Began to cough in fall of '97 and raised mucus which later became muco-purulent, and by August, '98 amounted to eight ounces daily. Cough was severe, patient anaemic and reduced twenty pounds in weight, which was then 141 pounds. Temperature was 101.5°, pulse 90. Examination showed marked dullness over upper and middle lobes of right lung with some moist rales. Small cavity in each upper and

middle lobes. Also evidence of infiltration of left apex with some crackling on deep inspiration over a small area. Tubercle bacilli abundant.

Result after six months' treatment: cough entirely gone, no expectoration, left lung clear, no rales in right lung, but still harsh blowing respiration, weight 159.5 pounds, a gain of 18.5 pounds, pulse 70, temperature 98.6°, condition greatly improved.

This case relapsed on March 14, after severe exertion in riding a bicycle and taking cold. Severe pleurisy set in confining him to bed for nearly six weeks, followed by some expectoration, loss of weight twenty pounds, but patient has since been under treatment and is rapidly improving as in former instance and has already gained about ten pounds.

CASE VIII. Female, aged 28, married, two children. Maternal aunt and paternal grandmother died of tuberculosis.

Took severe cold in July, 1896, and never fully recovered. Has had several attacks with severe cough and night sweats, being confined to house several weeks at a time. In intervals improved. Spitting of blood commenced November, '98, and occurred at intervals until treatment was begun in February last. Weight 97 pounds, normal 130 pounds, pulse 90, temperature 101°. Cough very severe and constant especially at night though expectoration did not exceed two ounces per day, mucopurulent, sometimes bloody and containing very large numbers of tubercle bacilli; marked anaemia.

Exploration showed mucus rales in left apex with bubbling rales and cavernous breathing below the clavicle. Prolonged blowing expiration to the fourth rib. Right side showed harsh inspiration and prolonged expiration down to third rib, but no rales.

Result after three months' treatment: pulse 68, temperature 99.4°, cough slight, no night sweats, very little expectoration, free from blood but still containing tubercle bacilli, no gain in weight but strength and general condition is greatly improved. Gude's peptomangan was used in this case as well.

CASE IX. Male, aged 41, single, miner. Family history good. Trouble began with a cold in November, '97. Spent next year in New Mexico and Arizona with no benefit. Consulted me in February last, at which time his cough was severe, expectoration profuse, mucopurulent, six ounces per day. Had small hemorrhage February 12. Exploration showed infiltration of entire upper lobe of the right lung, with cavity on level with the second rib. Some moist rales in apex. Also infiltration of greater part of left upper lobe with rales below clavicle.

Temperature was 100°, pulse 85, weight 154 pounds and patient was anaemic.

Result after four months' treatment: temperature 99.4°, pulse 78, weight 149 pounds, a loss of nine pounds. Cough much reduced, though little reduction in expectoration. Rales still present. Little improvement. This is the only patient using stimulants during treatment and taking more exercise than allowed.

CASE X. Male, aged 48, married, real estate and mining broker. Family history good. In excellent health until fall of '97 when he took severe cold which grew worse in spite of treatment. Weight fell off in six months from 180 to 130 pounds, a loss of 42 pounds up to middle of June, '98, when temperature was 101° and pulse 115, expectoration profuse, purulent, twelve ounces per day, and cough almost constant. Tubercle bacilli abundant. Exploration showed the entire right lung involved with extensive cavity giving gurgling rales in right middle lobe. Rales profuse over entire lung. Infiltration with fine rales over apex of left lung. The remainder of the left lung seemed quite healthy.

I had no hope for this case but he urged me to treat him and I began the use of the watery extract on him in August last. He not only stopped losing in weight but gained seven pounds, which however was lost after taking a severe cold.

Result after nine months' treatment: pulse 90, temperature 100.2°, weight 135 pounds, a loss of three pounds, cough greatly improved, expectoration reduced to two ounces per day, general strength and appearance greatly improved.

CASE XI. Female, aged 22, married. This case had extensive disease of lungs also disease of tubes and ovaries, probably tubercular. Had cavity in left upper lobe, profuse purulent expectoration, night sweats, chills, 48 pounds loss in weight. Pulse 120, temperature 102°, tubercle bacilli abundant also streptococci. Condition remained unchanged after two months' treatment, except that cough was diminished, night sweats gone and appetite much better. Temperature, pulse and weight were unimproved.

CASE XII. Female aged 17, single. This case also had extensive involvement of both lungs with two cavities in right one. Profuse moist rales, expectoration at first moderate, becoming later profuse. Temperature 103.5°, pulse 120. Large numbers of tubercle bacilli, strepto and staphylococci in sputum. This case was sent from a distance for treatment. She appeared to improve for a short time, but soon began to fail and seven weeks after treatment was begun, died.

THE LOCAL TREATMENT OF LUNG DISEASES.

BY BENJ. F. LVLE, M. D., CINCINNATI, OHIO.

The results we hope to obtain by the application of medicines locally in diseases of the lungs are a cure, or amelioration of the local inflammatory, ulcerative and septic conditions with the consequent removal of their local and systemic manifestations.

By this method we secure for the stomach exemption from the effects of drugs which frequently produce indigestion; and save our patients the consequent physical depreciation. These attempts are the result of the wonderful success attendant upon the local treatment of diseases of the upper respiratory tract, the natural inference being that like results would be obtained by the local application of drugs to the trachea, bronchial tubes, and even to the lungs.

The pioneer of the local treatment of diseases of these organs was Dr. Horace Green of New York, who first published his methods and results in 1840.

In 1859, after an extensive experience of many years, he wrote: "If I were required to relinquish all known therapeutic measures, to topical medication in the treatment of thoracic diseases, I should choose the latter, with hygienic means alone, in preference to the entire class of remedies ordinarily employed in the treatment of these diseases."

Unfortunately, the inability to inspect the lesions in any particular

case compels us to judge of the conditions present by analogy, or by the knowledge acquired by postmortem investigations and scientific research.

Before considering the practical application of this method of treatment it will be well to bear in mind the following facts. The air in the bronchial tubes during inspiration meets with an obstruction equal to one half millimeter of mercury; and on expiration of from two to three millimeters.

The inspiratory pressure may reach from nothing to eight m. m. of mercury; and the expiratory pressure from nothing to thirteen and one-half, the higher being due to expiratory dyspnoea. (West).

Even when the inspiratory and expiratory pressures are high the respiratory oscillations may be very slight or even absent. West also states that in one instance when the inspiratory pressure was plus nine the expiratory pressure was the same, respiratory oscillation being absent. Where there is no dyspnoea the respiratory oscillations are apt to be small and may be completely absent.

The contractibility of the lungs is not due entirely to elastic tissue, but to a certain extent to muscular tissues; the functional abilities of the latter are quickly affected by any local or systemic disease, the respiratory oscillations becoming deficient. When the parenchyma of the lung is seriously involved or when the pleura is adherent to any extent to the chest wall the respiratory oscillations are interfered with to a proportionate degree; sometimes being entirely abolished. When this condition prevails for a considerable period the opposite lung becomes correspondingly hypertrophied.

The lungs are richly endowed with lymphatics which under ordinary conditions rapidly absorb any extraneous or inflammatory material which may be found in the alveoli and smaller tubes. This function depends largely upon variations of pressure in the lymphatic vessels brought about by the respiratory oscillations; hence the term "lymphatic pump."

A like change takes place in the pulmonary blood vessels during respiration. The knowledge of these physiological facts is of importance when considering our subject and teaches the futility of endeavoring to reach diseased portions of the lungs in which the respiratory oscillations are deficient or entirely absent, by means of medicines in a gaseous state.

These deductions are borne out by the experiments of Schreiber, who finds that finely pulverized substances may in diseased lungs even find entrance into the alveoli; but in order that this may take place it is

necessary to have a combination of pressure with aspiration. While the pressure can be readily supplied, when disease of the lung is present the aspiratory influence is compromised or perhaps absent. "Thus if the lung has lost elasticity so that new air no longer enters, it follows that substances mixed with air will not enter."

"The diseased processes which so lessen the elasticity are not sufficiently considered. "It has been found that in healthy animals exposed to air loaded with coal dust, the larger and smaller bronchi were reached in fifteen minutes; that in animals with diseases of the lungs, as bronchitis and miliary tuberculosis, substances mixed with atmospheric air enter in greater quantities than in healthy animals. But the distribution of substances is very uneven, for while coal dust can be seen in clumps in healthy lung nothing whatever appears in diseased foci."

"The general law applies not only for infiltrations and scars (that is, where there can be no air) but also for processes accompanied by ulcerated foci and cavities." (1).

In the treatment of the diseases of no other organ has the study of bacteriology produced greater changes than in that of the lungs.

While lung diseases were supposed to be due simply to aberrations of ordinary vital processes, tuberculosis being due to inheritance and colds, and pneumonia and bronchitis to exposure—no indications existed for other than general treatment.

In the light of our present knowledge we realize that something more than inherited or predisposing factors are involved and for this knowledge we are indebted to the science of bacteriology.

For instance, we now know that consumption is not a simple process, and that the lesions of tuberculosis invite the attack of various septic agents whose activities result in increased local and systemic difficulties. These germs of "secondary infection" and their lesions are what we hope to remove by local treatment. Its advisability and desirability is unquestionable, the only query is, when and how.

During the acute stage of bronchitis when the membranes are dry and congested and the secretions absent, local treatment is contraindicated. When the stage of secretion is reached local treatment is invaluable. The other conditions in which we derive valuable aid from this method of treatment are: chronic laryngitis with or without ulceration; tubercular laryngitis, even when extensive infiltration and ulceration is present; chronic tracheitis and bronchitis; asthma; emphysema when accom-

(1) Homer M. Thomas, *Journal Amer. Med. Soc.*, Vol. 30, p. 1259.

panied by bronchitis; pulmonary tuberculosis; bronchiectasis; syphilis of the lung when complicated by disintegrating gummatous masses.

By means of local treatment without taking into consideration its incidental constitutional effects, we obtain results that cannot be secured by the devious and uncertain route by way of the stomach. Among the effects produced the following may be enumerated:

ANTISEPTIC.—This is shown by the change in the appearance of the secretions, the purulent, yellow expectoration becoming clear and the fetor of bronchiectasis dispelled. The removal of the contents of cavities, disinfection of their secretions and diminution of their size. The consequent diminution of the septic material absorbed is shown by decrease of fever, night-sweats and physical exhaustion.

EMOLLIENT AND ANAESTHETIC.—Sensitive areas, the irritation of which results in coughing, are rendered less susceptible; hoarseness is diminished, and tenacious secretions are more readily removed. As a result of the removal of these harassing symptoms the sleep of the patient is unbroken, his respirations are deepened, and his general condition is correspondingly improved.

Local treatment also relieves congestion and diminishes the hypertrophy of the mucous membranes by means of its astringent and stimulating influences; and as a result there is an improvement in the vital functions of the parts, conservative processes being also inaugurated in parts not under the direct influence of the drugs.

In consequence of these beneficial changes a larger volume of air is admitted to the diseased area and thus some of the favorable results, incident to greater physiological activity, are realized. The absorptive functions are increased, deleterious products removed, and drugs given a better opportunity to act.

The medicines employed must be those that are unirritating and that vaporize slowly at the temperature of the body. The only exception to this rule is Chaplin's creosote method of treating bronchiectasis. Here it is the intention to cause sufficient coughing to expel the secretions and disinfect the cavity walls. For the purpose of reducing congestion and producing anaesthesia, drugs like menthol and camphor are employed; for the antiseptic effects guaiacol and eucalyptol: as aqueous and alcoholic menstrua are too irritating, oils are employed as the vehicle, pure olive oil, the light petroleum oils and cod liver oil being favored.

For experiments showing the antiseptic action of drugs frequently used in intratracheal injections we are indebted to Dr. A. H. Peck of

Chicago (1). His experiments are particularly valuable to us because they were conducted with the fact in mind that "an antiseptic must be regarded as a poison to the vegetable cell; and many of them act also as poisons to the animal cell." The following is a summary of his results with drugs that are of interest to use in connection with our subject:

	Antiseptic Value.	Poisonous to Tissues.		Antiseptic Value.	Poisonous to Tissues.
Oil cassia	1—2233	Yes	Carbolic acid 95 per cent.	1— 338	Yes
Oil cinnamon (Ceylon)	1—2100	Yes	Oil myrtol	1— 357	Yes
Oil cinnamon (synthetic)	1—2133	Yes	Oil cajuput	1— 120	No
Cresote (beechwood)	1—1280	No	Eucalyptol	1— 116	No
Oil cloves	1—1150	No	Oil gaultheria	useless	No
Oil bay	1—1028	No	Eugenol	useless	No
Oil sassafras	1—1000	No	Formalin	—	Yes
Oil peppermint	1— 875	No			

Koch's statistics derived from experiments with anthrax spores are:

	Growth Checked.	Growth Ceased.		Growth Checked.	Growth Ceased.
Bichloride of mercury	1—1,600,000	1—300,000	Eucalyptol	1— 2,500	1— 1,000
Thymol	1— 80,000		Boracic acid	1— 1,250	1— 1,800
Oil cloves	1— 5 000		Carbolic acid	1— 1,250	1— 850
Camphor	1— 2,500	1— 1,250			

The bacteriological experiments of Blaxall have shown the inefficiency of the essential oils in controlling the growth of tubercle bacilli. Inhalations of 6 per cent. solution of formaldehyde seemed to be attended with favorable results.

How to introduce these various medicaments is the next question of importance. For some years occasional mention has been made of injections into the diseased portions of the lungs; this procedure has been followed in some instances by an attempt to increase the influence of the drug by electrolysis. This method is apt to cause inflammatory changes with resultant fibrinous exudation; and from a theoretical standpoint may be regarded as a valuable procedure. However, it has not succeeded in gaining the confidence of the profession.

For the purpose of influencing the pulmonary tissues by local remedies the tracheal route is the one employed, the medicines being introduced in a state of minute subdivision by means of inhalers, vaporizers, nebulizers and spray apparatus; or in its fluid condition by means of a tracheal syringe. The experiments cited in the early part of the paper will prove the futility of endeavoring to influence diseased portions of the lungs by means of medicines in the form of sprays, vapors or gases if the lesion is situated beyond the second subdivision of the bronchial tree: and even those parts which can be thus influenced can be better

treated if the remedy is used in a fluid state, for the following reasons.

The medicine is exhibited in the only form in which it can be efficacious, the theory that sprays can be carried further into the lungs having proved fallacious.

Large quantities can be used.

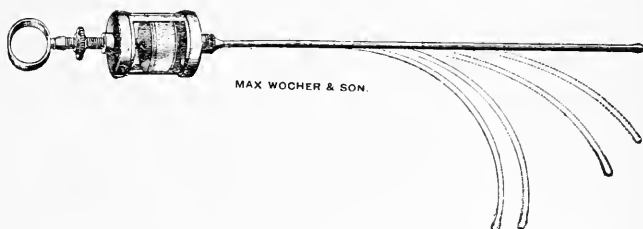
Insoluble drugs like iodoform can be administered.

The specific gravity of a fluid enables it to enter portions of the lungs not accessible to sprays: by directing the point of the syringe to one side or the other, or by having the patient recline to one side, the medicine can be directed to the diseased portion of the lungs.

The slow evaporation of the remedies employed, prolongs their influence for a considerable time.

The absorption of the remedies extends their influence to portions of the lungs beyond the air passages.

The syringe used for making the injections was devised by Dr. Muir and is capable of holding one-half ounce; the tube is of metal and can be bent to any desirable curve.



The technique is thus described by Dr. John A. Thompson: (1).

“There are few technical difficulties in this method. With the parts illuminated as in an ordinary application of medicine to the larynx, the curved tip of a laryngeal syringe is carried back over the glottis. While the patient takes a slow, deep inspiration, the remedy is injected between the vocal cords into the trachea. In the earlier treatments it is sometimes advisable to anaesthetize the larynx with cocaine. Later, when the patient recovers from the nervous apprehension that is so often excited by manipulation about the throat, cocainization of the larynx is neither necessary nor advisable. Where the patient has sufficient self-control to breathe slowly, deeply and regularly with the laryngeal mirror in position, it is easy to inject solutions into the trachea without passing the tip of the syringe below the glottis. This latter method is not advisable in ordinary treatments. There is apt to be some injury to the parts in in-

roducing the syringe between the cords, or in withdrawing it. Where cocaine is not employed, a reflex spasm is excited by the contact of the syringe that makes the treatment disagreeable and sometimes painful to the patient. This is not necessary if physician and patient co-operate, the latter breathing as directed and the former regulating his movements by those of the larynx."

The objections made to this method of treatment are usually theoretical and are not borne out in practice.

Ewart writes disparagingly of it in Albutt's system of Medicine. My own experience has not, however, confirmed his unfavorable prognostications. It has been used at the Cincinnati Branch Hospital for Consumptives daily for the past two years, during which time thousands of injections have been given. No complications have ever caused us to regard its use with apprehension; but on the other hand we consider it an indispensable factor in contributing to the relief of those committed to our care.

USE OF PROTARGOL IN DISEASES OF THE LARYNX AND PHARYNX.

BY H. J. CHAPMAN, M. D., ASHEVILLE, N. C.

Nitrate of silver has for a long time been a favorite remedy in catarrhal inflammation of the pharynx and larynx. Unfortunately its irritating effect limits its usefulness in the acute stage, and it is only in the subacute or chronic conditions that applications of this drug are well borne. Again, its action is limited to the superficial layer of the epithelium, as it coagulates the mucous present, and if our solutions are sufficiently strong a superficial necrosis occurs.

In the latter instance, the parts thus robbed of their natural covering furnish a good ground for the invasion of any infection that may happen to be present. In this manner the application of silver nitrate to an acute inflammation is productive of harm, and we may have under such circumstances a deeper invasion than would otherwise have occurred.

An astringent antiseptic free from these faults has been a desideratum. I have found Protargol to more nearly fulfill the indications than any drug with which I am familiar. It is not irritating even in a ten per cent solution, and has the added advantage that it is not precipitated by albumens but seems to be absorbed by the mucous membrane if kept in contact for any time.

In the forming stage of an acute pharyngitis or laryngitis, I apply a five per cent. solution by means of a cotton wrapped probe, and often

succeed in aborting the attack. In the subacute or chronic form of inflammation a ten per cent. solution will be found most useful, and applications should be made at least once a day by means of a cotton swab, which should be held in contact with the inflamed membrane for a few moments at each treatment.

Even in tubercular ulcerations of the larynx, the daily application of this drug seems to stimulate the reparative process and healing is often hastened. In fact since commencing its use I have less often found it necessary to curette these ulcers and apply lactic acid.

In the superficial erosions often seen in a larynx infiltrated with tubercle, the timely application of a five per cent. Protargol solution will not only prevent the deeper ulceration, but will often cause the erosion to disappear.

The three cases instanced below will illustrate the range of application of this drug:

Case 1.—Male, age 35. Tubercular disease in lungs. Complained of slight hoarseness and tickling in larynx. Examination showed small ulcerated area size of a pea upon the left cord. This was superficial and seemed to involve only the epithelium. I applied a five per cent. solution Protargol every other day for ten days. The ulcer healed and symptoms disappeared.

Case 2.—Complained of running at nose, constant desire to clear the throat and deafness in right ear. Examination showed subacute rhinitis and naso-pharyngitis. Posterior nares filled with thick mucopurulent secretions. Nose and naso-pharynx was washed out daily with warm alkaline solution and a five per cent. solution of Protargol applied to posterior nares by means of an applicator after each washing. After three applications membranes appeared normal and all symptoms disappeared.

Case 3.—Complained of dryness in throat, irritative cough and some difficulty in swallowing. Examination showed an inflamed membrane in pharynx over tonsils, and larynx including one vocal cord. Patient was directed to gargle with hot alkaline solution every hour during the day. I applied Protargol solution five per cent. to inflamed surface, except larynx, twice a day. To the larynx the application was made but once a day. Recovered in two days.

My somewhat limited but satisfactory experience with upward of 50 cases like those mentioned would lead me to believe that in Protargol we have a drug of much value in simple inflammation of the mucous membrane, and one at least worthy of a trial in the slighter ulcerations of the same.

REVIEW OF CURRENT LITERATURE.

ON THE QUESTION OF THE INFECTION OF MILK OF TUBERCULOUS COWS AND THE USES OF TUBERCULIN INOCULATIONS.

BY DR. LYDIA RABINOWITCH AND DR. WALTER KEMPNER, IN BERLIN.

Numerous bacteriological investigations of milk during the past decade have furnished experimental demonstration of the occurrence of tubercle bacilli in the market milk in a higher or lower percentage of cases. For example L. Rabinowitch using the physiological test has found bacilli in 28 per cent. of samples of Berlin market milk.

A further question was then to be answered, whether the milk which contained the bacilli came only from cows with general tuberculosis and consequent implication of the udder or also from animals devoid of udder tuberculosis which simply had more or less pronounced pulmonary tuberculosis. There has been a large series of investigations which seek to determine this point, made by Bollinger, May, Stein, Bang, Hirschberger, Ernst, Smith Schroeder and Delepine; and according to the results obtained milk of tuberculous cows was found to be infectious to animals in from 6 to 55 per cent. The most readily infectious milk came from cows which were affected either with advanced general tuberculosis or with tuberculosis of the udder; although in single cases the milk of cows presenting only a slight degree of tuberculosis was found to be infectious.

In opposition to these experiences stands the oft-repeated opinion of Nocard that infectiousness of the milk was present only in a clinically demonstrable tuberculosis of the udder.

If we accept the most favorable interpretation (which indeed hardly conforms to the facts) that the milk of highly diseased cows, or of those with pronounced tuberculous udders seldom or never reaches the consumer because of the necessary precautionary measures such as pasteurization and sterilization, then according to the present state of science the question which furnishes a title to this paper should be formulated as follows:

Does the milk contain tubercle bacilli

1. In the early stage of tuberculosis without demonstrable affection of the udder?

2. In latent tuberculosis demonstrable only by the tuberculin test?

This second point has been too little regarded in the experiments made since the epoch-making discovery of tuberculin. As the Minister of Agriculture has recently ordered that attempts should be made at the

veterinary college to use various methods for the cure of tuberculous cattle, a great number of tuberculous cows were purchased with this end in view, the researches being under the direction of Professor Schutz. At the request of Professors Koch and Schutz we have attempted to answer the questions above mentioned by experiments upon these cows undertaken from the points of view as already formulated.

Fifteen cows were used in the experiments, all of which animals reacted to tuberculin. The milk was examined about three months after the inoculation with tuberculin. The milk with all precautions of cleanliness was milked directly into sterilized glasses, and the second portion of the milking after subjecting it to the centrifugal process was used for investigation; the fat and sediments being both examined. Positive results were obtained in ten cases (66 per cent.) by inoculation of animals. With regard to the clinical condition of the cows, determined by Prof. Eggerlin we learn that of the ten cows giving infectious milk:

1. Only a single cow (No. 12) had clinically demonstrable tuberculosis of the udder.

2. In cow No. 9 histologically demonstrable udder tuberculosis was present.

3. In cows No. 1, 6 and 11 which showed advanced generalized tuberculosis there was a histological picture of chronic interstitial inflammation, but no udder tuberculosis.

4. Cow No. 4 showed a low degree of tuberculosis.

5. Cow No. 10 was found to be tuberculous only after the second or third examination.

6. Cow No. 8 showed rales during the first examination, but two later investigations failed to reveal tuberculosis.

7. Cow No. 2 showed no signs of tuberculosis after three examinations. Neither were there any apparent traces of disease in cow No. 14.

This condition shows us that our results, not only in regard to the highest percentage of cases of infected milk, but also with reference to clinical findings, vary notably from the statements made by previous writers, who in the majority of cases found bacilli in the milk only in udder tuberculosis or in very much advanced tubercular affection.

According to our results we must answer the questions asked by us above as follows:

Tubercle bacilli may be found in milk,

1. In beginning tuberculosis and without demonstrable disease of the udder.

2. In latent tuberculosis demonstrable only by the tuberculin reaction.

If there have heretofore been only uncertain notions in regard to the infectiousness of the milk of those cows which react to tuberculin, without manifesting visible symptoms of tuberculosis, we hold ourselves justified despite the small number of our experiments in the assumption that the milk of cows which react to tuberculin must in every case be looked upon as suspicious.

We perceive therefore that the question which interested us—the diagnostic value of tuberculin—has a great significance; and that hence we must recommend along with the clinical investigation and bacteriological supervision of milch-cows the tuberculin test, though it may be difficult to carry it out, as the most important measure for procuring milk free from tubercle bacilli.

To this end it is to be hoped that private and state care will interest itself more than heretofore with the tuberculin test, in order to antagonize the growing dangers to the public health through milk and milk products.

TUBERCULOSIS AND SMALLPOX.

Lop (*Revue de la Tuberculose*, April, 1899,) refers to the discovery announced by Laudowzy in 1888, of the frequency with which former victims of small-pox become tuberculous in after years. At the conclusion of his paper (read before the Congress of Tuberculosis), Laudowzy besought those in power to make vaccination compulsory as an aid to eradicating the tuberculous predisposition.

Lop has followed up the study of this subject by investigating 140 cases of small-pox victims who sooner or later became tuberculous. Of this number 64 were personal cases, 54 were studied by Revilliod of Geneva and the remainder were collected by Chauvain (*These de Paris*, 1897), from the clinic of Prof. Laudowzy.

To those who would deny in advance the significance of these figures Lop states that his 64 cases were all collected within less than a year. He has besides the verbal declarations of a number of prominent hospital physicians that the apparent casual relationship between the two diseases is not due to coincidence. With regard to the part played by heredity, Lop found evidence of this nature in but seven of his personal cases. The personal antecedents were equally negative. Thirty-seven of the patients were hard-working laboring people, probably poorly nour-

ished and somewhat alcoholic, but there was no evidence of any specific predisposition aside from the fact they had had variola. The other 27 personal cases were in people who were well-situated socially.

Of Revilliod's patients (54), only 4 showed a history of parental tuberculosis, and 7 had collateral ascendants or near relatives who were tubercular. The personal history was completely negative.

In Chauvain's (22) cases, but 2 had any family history whatever of tuberculosis. Hence of 140 cases only 20 exhibited any evidences at all of heredity. With regard to the duration of the interval between the time of occurrence of the two diseases, late infection appears to be the rule. Of Lop's 64 cases, 16 developed tuberculosis within the first four years after the attack of small-pox; 38 developed the disease within the first decade, and 26 within the second decade after the early infection. Revilliod's observations extend over a period of forty years. Of his material, 18 cases did not become tuberculous until between 25 and 40 years after the variolous infection. Chauvain's figures are even more strongly suggestive of late infection.

These figures by themselves would perhaps not signify very much because they are not only small, but they attack the problem from one side only. Laudowzy, however, studied the question from another point of view by following up 300 cases of variola; and the astonishing result of his studies was that not more than 3 per cent. of this number escaped tuberculosis in the long run. The weight of evidence then is in favor of late infection of the variolous by tubercle; from 10 to 30 years after, being about the average. When the debut is early, the tuberculosis is usually of the galloping type. The more intense the variola, the more likely is the patient to contract tuberculosis at an early date.

It is thus easy to see how variola is able to assist in the diffusion and maintenance of tuberculosis, and further, that it is even more relentless and malignant than has been imagined; since it slowly exterminates its original survivors in after years by the aid of another great scourge. The lesson of the need of compulsory vaccination needs to be told anew.

CHANNELS AND SOURCES OF TUBERCULAR INFECTION.

Ransom in his essay entitled "Researches on Tuberculosis" (London, Smith, Elder and Co., 1898) and which was awarded the Weber-Parkes prize for 1897, discusses under the above heading the question of infection by the generative organs, skin, gastro-intestinal tract and air pas-

sages. He concludes that while cases of congenital tuberculosis have occurred they are of such extreme rarity, both in man and animals, that in routine practice it is safe to exclude the possibility of their existence.

The opposite view of Baumgarten is mentioned, viz.: that tuberculosis is essentially a congenital disease, even to the extent of occasionally skipping a generation.

In inoculation-tuberculosis, which happens often enough, nature usually protects the organism by the production of a tuberculous ganglionic abscess of the nearest lymphnode the parasite being discharged with the pus, there being no doubt that most of the cases of strumous glands are due to the infection of pre-existing sores by tuberculous matter which is usually sputum.

The relative danger of infection from tuberculous food products is problematical in the case of meat, but with regard to infected milk, the opinion as to the dangers attending its use is unanimous.

Most cases of food-tuberculosis are examples of abdominal localization, but exceptionally the signs of infection may appear first in almost any locality (lungs, cranial cavity, etc.). Experiments on animals appear to show that the tubercle bacillus may traverse the intestinal wall without causing any local lesion.

Infection through the air passages by means of tuberculous dust the author considers the most common of all the modes of transmission, this being shown by experiments, by the constant results of overcrowding and by the relative immunity of sparse populations.

With regard to mouth-to-mouth infection,—contagion in the narrower sense of the term,—the author decides that it plays a subordinate part in transmitting the disease.

To sum up in a few words: tuberculous dust arising from dried sputum is the greatest menace to mankind, tuberculous milk coming next in order.

The author concludes this chapter with an account of mixed infection, but at present authors differ so widely in their views that there is no possible way in which these diverse opinions can be harmonized.

Some see mixed infection in every phase of phthisis, while others say that tuberculous lesions are immune from attack by other bacteria. The author gives a full account of two cases of apparent mixed infection, and believes that the proper way to throw more light on this subject is to publish similar cases.

ARE THE TONSILS FREQUENTLY A PORT OF ENTRY FOR TUBERCLE BACILLI?

Scheibner (*Deutsche Med. Wochenschrift*, May 25, 1899) speaks of the great activity which at present obtains in the direction of seeking the port of entry of the tubercle bacillus. All modes of transmission are comprised under four categories, viz: placental or congenital; inoculation; alimentation; and inhalation.

Inhalation-tuberculosis is the most frequent; but its precise mechanism is by no means clear. We do not know where or how the bacilli enter the respiratory tract; although the recently published work of Birch-Hirschfeld appears to have greatly simplified the understanding of the matter.

Bacilli inhaled and on their way to the lung tissue may be arrested in the nose, pharyngeal tonsils, vocal chords, etc., etc., and the two tonsils—palatal and pharyngeal—are probably more exposed to this lodgment than any other structures seated in the upper air and food passages.

Virchow believes that the tonsils possess relative immunity against tubercular infection; but in quite recent times numerous instances of tonsillar infection have come to light; and the existence as well, of secondary tonsillitis from autoinoculation with sputum is certainly not unusual.

The question of primary tonsillar tuberculosis is more obscure; but there are not wanting authorities who believe that it not only occurs, but is by no means rare.

The tonsil is doubly exposed to infection, viz: through inhalation and through alimentation. As yet, however, the matter of primary infection is unproven clinically, although it has been recognized post mortem.

In some of these cases the evidence is insufficient. It is simply claimed that the tonsillar focus appeared to be older than other tubercular foci and hence its priority of infection was taken for granted. But whether primary or secondary, the disease attacks a tonsil already hypertrophied or inflamed, as is the case in other kinds of infection.

In considering primary tubercular infection Scheibner, for the sake of simplicity, excludes cases of possible alimentary origin. It is known that the air may contain tuberculous dust and that this may lodge on and around the tonsil. The capacity of the tonsil for absorption is, however, unknown. The compression incidental to swallowing tends to empty the tonsillar crypts; and after the act of swallowing it is likely that the crypts are able to take up fluid substances upon the tonsils, by suction. In this way bacilli inhaled with the dust might readily enter the crypts.

A step nearer the point of the subject was made by Strauss of Paris, in 1894, in the discovery of virulent tubercle bacilli in the nasal cavities of healthy individuals, who were much in the company of phthisical subjects. From his findings it would appear to be impossible for the tonsils to escape intimate contact with the bacilli.

The author's own experiments were made at the request and with the advice of Prof. Birch-Hirschfeld in the latter's laboratory at Leipsig. Many recently removed tonsils both palatal and pharyngeal were examined. These had been removed from healthy young individuals in the course of ordinary laryngological work by Dr. Thies of Leipsig. Other material was furnished by the tonsils of cadavers.

Of 28 cases of tonsils removed during life, in 26 the results were negative; while in 2 others tubercles and giant cells were found. No bacteria were demonstrated.

The results in 13 cases of tonsils removed post mortem were entirely negative as to the presence of tubercles or tubercle bacilli.

The results in six other cases in which the tonsils were removed post mortem from individuals with healed tubercular foci showed that the tonsils themselves were normal. In one case the healing of the tuberculous foci (bronchial glands) was found to be only apparent, some of them being still virulent. In another case there was a tonsillar ulcer but no evidences of tubercle was present. Two other cases showed scars and one a chalky deposit in the tonsil, but evidence of tubercle was negative.

In a third group of tonsils removed post mortem, four in number, there were latent tubercular foci in the cadavers. In none of the cases was there any macroscopic evidence of tubercle; but one of the four tonsils showed histological evidences of tubercle. Bacilli were not found.

The patient, aged 18 months, had died of diphtheria after a lingering illness of six weeks subsequent to tracheotomy and intubation; the mother died during the same month from phthisis. Autopsy, (not made on mother) showed on the child tubercular tonsils (microscopic), also tubercular disease of the cervical glands, bronchial glands, and in the inferior angle of left lower pulmonary lobe; recent tuberculosis of medullary portion of portal lymph-glands; old yellow caseous foci in mesenteric glands. In the ileum there was a radiating scar of an old tuberculous ulcer; and near by a caseous nodule in the mucosa.

Theoretically the author considers here three possibilities of infection, viz: congenital, alimentary and by inhalation. There is no doubt of the presence of alimentary tuberculosis; but this condition was undergoing resolution at the time of death. The mesenteric and portal tuber-

culosis was of recent character in part; but owing to the apparent age of certain of the foci in the mesenteric glands it would almost be necessary to believe them of congenital origin.

The mother was surely tubercular when she bore the child. The tonsillar lesions were doubtless primary and of alimentary origin; while the involvement of the cervical glands may have been secondary to them. It is not so easy to explain the single pulmonary focus. By exclusion, however, we must look upon it as due to inhalation. This lesion might possibly explain the occurrence of the foci in the alimentary canal, the child having swallowed its sputum; but the recent character and slight dimensions of the pulmonary lesion tend to make this theory untenable. The author concludes that the tonsillar lesion was primary, and that well marked alimentary tuberculosis was present in the intestines. Further than this it is not easy to decide as to priority and causal relation.

In the fourth group of six cases in which the tonsils were removed post mortem, extensive pulmonary phthisis coexisted with generalized tuberculosis. Of these six cases four had tubercular lesions of the tonsils, which were clearly secondary.

A fifth group was made up of two cases of acute miliary tuberculosis without ulceration of the lungs. In these cases the tonsils were entirely free from tubercle.

One case was unique and is described by itself. There were extensive signs of recent pulmonary disease; adhesive pleurisy, foci of catarrhal pneumonia, diffuse capillary bronchitis, emphysema, etc. Both tonsils and cervical glands were tubercular. The author was unable to decide as to whether or not the numerous pulmonary lesions represent an example of recovery from tuberculosis. Death had been due to tubercular meningitis. If the pulmonary lesions were non-tubercular this case must have been an example of primary tonsillar tuberculosis with secondary implication of the cervical glands and meninges. This case is of especial interest because it has been claimed that in tubercular meningitis the bronchial glands are invariably infected. These glands, however, were certainly not tubercular in the case under consideration.

In 32 cases therefore in which the tonsils of tubercular and non-tubercular individuals were studied, post mortem, there were two cases which the author chooses to regard as primary tonsillar tuberculosis. If we combine with this material the 28 cases in which the tonsils were

studied during life the total result is four presumably primary infections out of 60.

In another set of experiments the author repeated the Guinea-pig inoculations of Dienlafoy and Cornil. He used for this purpose 42 freshly removed palatal and pharyngeal tonsils. With one possible exception the results were all negative. In the exceptional case, some of the glands were caseous, but the picture was not typical of Guinea-pig tuberculosis.

Scheibner also studied the subject of tonsillar tuberculosis with the aid of a new culture-medium devised by Hesse of Dresden, with the view of producing cultures from the suspected organs. He made use of 20 tonsils for this purpose.

The results were negative.

The author appears to be satisfied that primary tuberculosis of the tonsil is not a lesion to which the great mass of mankind are much exposed. It might be otherwise with selected cases of people who are in constant communion with phthisical subjects, in types of which Strauss found virulent bacilli on the surface of the throat. The untimely death of this investigator left his important researches in an incomplete condition and similar studies ought to be made by resident physicians in sanatoria.

THIRTY-FOUR CASES OF PULMONARY TUBERCULOSIS TREATED WITH KOCH'S TUBERCULIN.

Dr. Krausse of Vietz, Germany, reports his experience and results with Tuberculin in a paper to appear in the *Zeitschrift für Hygiene und Infektions Krankheiten*, showing that of 34 cases treated 12 were "temporarily cured." He purposely uses this designation for his results, since a long time must elapse before we can speak of an actual cure, and which is only then proper, when all tubercle bacilli in the organism have perished.

As temporarily cured he designates all cases which have remained in good health for at least a year from the discontinuance of treatment, the objective symptoms of tuberculosis having disappeared and in which after the lapse of a year no response to a trial injection of Tuberculin is obtained. Two of his temporarily cured patients received such a trial injection and did not react, one other was free from relapse after nearly two years; the other nine cases continue well after from three to five years since the treatment was completed.

Eight of the remaining 22 cases were improved to a degree that the author expects their eventual entire restoration; and two patients, one showing improvement, are still under treatment.

Three cases proved unsuitable to the treatment by responding with severe reactions to minute doses, and they were therefore excluded from further treatment.

Only in one case the treatment appeared to do harm, causing loss of appetite, weakness and emaciation, the symptom-complex suggesting an organism overcrowded with toxins; a result which the author believed was due to improper use of the remedy.

Excepting this case, the remainder of his cases improved and either did not complete the treatment or relapsed.

He also relates his various efforts to find the best method of administration. Some patients were injected twice daily, others only once, and still others at greater intervals. In some instances the doses were increased rapidly and in others slowly; and likewise, he endeavored to secure mild and severe reactions.

Single doses were increased far beyond Koch's original directions, one patient receiving 500 milligrams at a single dose. Several others received 300 milligrams in 24 hours and a girl aged 14 years received 600 milligrams in two doses within 12 hours. In two instances doses of 100 milligrams were given at intervals of a month, after the gradual increase from small doses had reached this amount.

From the observed results the author concludes that it is best to avoid marked reactions and to seek only local reactions, for the indications of the occurrence of which, a slight elevation of temperature is a reliable guide.

In two cases where the daily dose was divided the temperature was kept almost constantly a little above normal and the most brilliant results were obtained.

Under gradual increase and more frequent repetition the large doses were well borne, but the cases in which 100 milligram doses were given only once a month did not bear the treatment well.

TUBERCULAR ABCESES.

Menard (*La tuberculose infantile*, April 15, 1899), after alluding to the revolution in our knowledge of pus and abscesses brought about by microbe-biology, states that the old idea of "cold" and "warm" abscesses still persists because it is bacteriologically correct. The perfect

type of the cold abscess is found in the course of bone and joint tuberculosis. Fever is absent, as is inflammatory oedema; pain and discomfort are nearly or quite lacking. The collections of pus found in connection with Pott's or hip-disease might often be likened to a hydatid cyst as far as local symptoms are concerned. There is, however, usually a marked general action—pallor, emaciation, etc., due to the systemic poisoning,—although not rarely we find these abscesses in patients who seem to be in florid health.

The contrast between these cold abscesses and the ordinary acute "warm" abscess needs only to be mentioned here, as it is too manifest to require a detailed description.

The torpid or latent quality of the cold abscess by which it may persist for years is well known; it is also a fact that spontaneous cure may finally result through self-opening and evacuation, but this mode of termination is rare. The typical cold abscess is the simple tubercular abscess. What happens then when the bacteria of ordinary suppuration are associated with the bacillus tuberculosis in the production of an abscess? From the moment when the staphylo or strepto-coccus pyogenus is grafted upon a tubercular abscess the latter loses its cold quality. The curative injections which often bring about happy results are no longer efficacious. The course becomes acute; fever and pain set in, and immediate evacuation of the pus becomes necessary.

If the pyogenic bacteria invade a cold abscess of the lymph-ganglia, or a tuberculous arthritis, the severity of the affection is increased, but the surgeon still has everything under immediate control, because he can usually extirpate the focus whenever he desires. With Pott's disease this is not the case. While a cold, latent abscess in connection with Pott's disease is as a rule curable without opening, the converse is true after such an abscess becomes infected by the pyogenic cocci. Such a mixed abscess when it ruptures or is opened leaves a fistulous tract and a good result under such conditions is the exception.

How does a cold abscess become infected? Sometimes it happens in the course of scarlatina. As a rule the pyogenic microbes invade it by penetration of mucous surfaces when the abscess has attained such size that it comes in close relation with the bronchi or intestine, the mucosa having been previously altered by the pressure. The same fate may befall the cold abscess when it lies just beneath the skin, which latter becomes thin and altered from the pressure. It may thus become infected before any external opening exists.

Probably the surgeon himself infects these abscesses now and then

in attempting curative injections with unclean instruments. It is needless to say that the technique of these injections must be perfectly aseptic. The same accident has occurred after incision and curettage of a cold abscess, and in seeking to extirpate a tubercular focus about the hip the germs of suppuration may readily be admitted. Once the spine or hip thus infected, the surgeon is almost disarmed. A cold abscess evacuated may therefore relapse as a warm abscess with qualities the very opposite of its predecessor. In other cases the pyogenic infection of the cold abscess rouses the tubercle bacillus from a period of latency to one of activity. After evacuating and apparently curing a mixed abscess a relapse of the original cold abscess occurs after a long interval.

In conclusion it is a highly practical study to differentiate clinically between the purely tubercular and the mixed abscess, and especially when the site of the lesion is the spine or hip.

DIAGNOSIS OF TUBERCULOSIS DURING THE NURSING PERIOD OF INFANCY.

Bulius (Jahrb. f. Kinderheil-Kunde, 1899, No. 2-3) has attempted to clear up some of the obscurity of this subject because of the general dissatisfaction expressed by leading clinicians with the uncertainty consequent upon our present methods. To this end he studied exhaustively in Prof. Heubner's clinic at Berlin a large number of cases of tuberculosis in nurslings, comparing the clinical with the post-mortem findings. To simplify matters he eliminated cases of tubercular meningitis and tuberculosis of the mesenteric glands; because in these cases the diagnosis is usually attended with less difficulty; so that his material was restricted to cases in which the mediastinal glands furnished the primary focus, with secondary implication of the bronchi and lung tissue and eventual dissemination of the infection through the vascular paths.

Bulius concludes from his studies that if the bacillus tuberculosis is not demonstrable in the sputum, and if there is no well-marked form of clinical tuberculosis of exposed localities (skin, bones), a diagnosis of internal tuberculosis in nurslings cannot with certainty be made.

There are, however, numerous data obtainable which enable the clinician to make a diagnosis of probable tuberculosis, while certain conventional symptoms are shown to be worthless or even misleading.

Of great value is a history of exposure of the child to a tuberculous parent or attendant.

Other phenomena which speak for tuberculosis are marked transfor-

mation of the child's temper; preservation of appetite and digestion with progressive loss of flesh and strength; slight swelling of the supraclavicular glands (enlargement of the glands of the throat and neck unless extreme has no significance whatever in the diagnosis of tubercle); paroxysms of cough are suspicious (but absence of cough does not exclude tuberculosis); torpid course of simple, non-specific affection of the skin, (boils, eczema), lead to suspicion of tuberculosis in the presence of other evidences of the disease.

The presence or absence of fever has no significance in the diagnosis of the disease under consideration; neither has the occurrence of enlarged spleen.

When the disease runs an acute instead of a chronic course, another set of data supply information useful for diagnostic purposes. Some of these data which give evidence pointing to acute tuberculosis are great unrest and jactitation; convulsions; absence of diarrhoea and nephritis; cyanosis and accelerated breathing; sputum in large balls; transitory collapse in apparently healthy children; medium and coarse rales with extensive pulmonary infiltration.

A NEW SIGN FOR THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.

Murat (Gaz. Hebdom. de Med. et de Chirurgii., March 5, 1899) describes the following subjective symptom: An abnormal sensation is experienced by the patient in the early stages of phthisis when he speaks loudly, or when in the course of conversation the voice is raised, the tuberculous lung vibrates, and the sense of discomfort is such that the patient instinctively holds the arm of the affected side close to the trunk. The patient becomes conscious that the vibrations of the voice are propagated on the affected side while he experiences no such sensation on the opposite or healthy side.

In one case in which this subjective sign was present auscultation could discover nothing wrong.

According to the author this symptom ought to be hailed not only as a sensory symptom of early tuberculosis of great value when the foci of disease are so seated that auscultation may not be able to reveal them, but as a phenomenon common to phthisis in general, at any stage.

To verify this claim, upward of sixty patients have been interrogated and examined in the Winyah Sanitarium within the last month, and in no single instance had the patients previously been conscious of the vibrations referred to; but after their attention was directed to the

sensation and being made to speak loudly, the phenomena was observed only in two out of all the cases, in one the disease has reached an advanced stage, in the other it is in an early stage.

From theoretical considerations only one would suppose that an amount of consolidation sufficient to increase the vibrations produced by the voice so that the patient shall become conscious of them, would hardly belong to the early stage, or offer any difficulty in its detection by physical examination of the chest.

LUMBAR PUNCTURE IN TUBERCULAR MENINGITIS OF CHILDREN.

Pfaundler (Arch. f. Kinderheilkunde, 1899, No. 2-3), has recently completed a series of 200 lumbar punctures in children at the clinic of Prof. Escherich at Graz. Speaking of puncture in general he regards it as particularly applicable to childhood; as the superficial situation and wide interspaces of the vertebral arches during that period tend to render the operation simple and safe.

Much of Pfaundler's interesting study is concerned with tubercular meningitis; and it is very apparent that the future of this operation of tapping the subarachnoid space is destined to be intimately associated with the diagnosis and treatment of that pernicious affection. Under the head of diagnosis, Pfaundler first calls attention to the importance of manometry. The normal pressure of the subarachnoid fluid, which is from 20 to 25 millimeters, runs up to 40 on an average in tuberculous meningitis; while in exceptional cases it has amounted to 110 mm. The pressure varies with the stage of the disease. In the period of irritation it averaged 48 mm.; in the period of cerebral compression, 52 mm.; during the stage of cerebral paralysis it was 24, and after death it fell to 11 mm.

Pfaundler next discusses the physical and clinical qualities of the evacuated fluid in tubercular meningitis. In all other affections of the meninges the fluid is turbid throughout; but in the disease under consideration there is never cloudiness at the outset, and the clearness may persist. As a rule, however, a peculiar opalescent cloudiness appears in the second stage. An equally marked peculiarity is the formation of a spider-web-like coagulum upon standing. The delicate fibrin net-work breaks up into flocculi upon shaking. The formation of this clot is almost a pathognomonic sign of tubercular meningitis.

Microscopical investigation of the sediment does not aid much in the differential diagnosis of tubercular from other forms of meningitis.

The most important clue furnished by the sediment is found in the count of the leucocytes. In the disease in question there is a very large number of mononuclear leucocytes.

A very high percentage of albumen is almost pathognomonic of tubercular meningitis. The normal proportion in health varies from .02 to .04 per cent. The percentage in tuberculosis starts at about .15 during the stage of irritation, runs up to .35 in the stage of compression, increases further to .4 in the paralytic stage, while after death it reaches the maximum of .625. The highest percentage found by Pfaundler at any time was a trifle less than 1 per cent. This "albumen-curve" which accompanies tubercular meningitis is of more diagnostic value than the high percentage; since a considerable amount of albumen accompanies some other meningeal affections.

Under the head of bacteriology, Pfaundler claims that Koch's bacillus is never absent from the cerebrospinal fluid in tubercular meningitis. He depends purely upon staining because of the quick results. He admits that great technical experience is necessary for the routine demonstration of the bacillus.

With regard to treatment the chief utility of lumbar puncture must be symptomatic. Lowering the sub-arachnoid pressure relieves the symptoms of intracranial irritation and pressure (hyperaesthesia, excitement, delirium, headache, convulsions, coma, etc., etc.). Pfaundler has found puncture of the greatest remedial value from this standpoint.

THE MEDICAL TREATMENT OF TUBERCULOSIS.

Schulz of Greifswald (Deutsch. Med. Wocheusch., May 25, 1899) says that generally speaking the remedies used against tuberculosis vary little from one century to another. It frequently has happened that a remedy advocated by the profession has been discarded by the latter only to be taken up by the public.

Aside from a few synthetic chemical remedies and certain exotic newly discovered plants the materia medica of phthisis is old. On account of the malignancy of tuberculosis the number of remedies which have been used in its treatment is of course very great; but all of them may be grouped under two heads.

The first division is composed of remedies directed against the disease itself which have actually shown themselves to be possessed of real therapeutic efficacy.

The second group on the other hand comprises all substances which

have no real efficacy against the disease, and which have been given oftentimes with intent to deceive the patient and encourage false hopes, and which through the influence of suggestion may appear to produce benefit at times.

The author attempts to enumerate all the articles of the *materia medica* which have been recommended for phthisis. For convenience he divides these remedies into two groups, one of which comprises such drugs as benefit the organism at large while the other is limited to remedies having special indications.

He enumerates drugs once official but now used only by the laity, and other plant products no longer thought of by physicians in connection with phthisis but which once enjoyed great favor among the members of the profession.

Some of the substances mentioned by him are *agrimony*, *chelidonium majus*, *marrubium vulgare*, *pulmonaria officinalis*, *sticta pulmonaria*, and so on through an endless list of plants, a number of which have entered into the formulae of secret remedies, popular "teas," etc.

The use of fats, including milk, for phthisis is old. Goat's milk, Kumyss, neat's-foot and olive oil, cod liver oil, etc., have all had extensive vogue in particular ages and regions, and the principle of using substances of this sort has become universal.

Among chemical alteratives which have been extensively used for phthisis, are iodine, arsenic, mercurials, gold, sulphur, phosphates and hypophosphites.

Gases have been used medicinally by inhalation—oxygen, nitrogen, hydrogen, ozone—without any resulting advance in therapeutics.

The balsams so-called are of especial interest in the treatment of phthisis, and the *Balsam Peruvianum* is perhaps the best known in this connection; the fact that its active ingredient cinnamic acid and its sodium compound are largely used in the treatment of phthisis through the labors of Landerer, is regarded by the author as a step in the direction of national therapeutics.

Tar and creosote and allied substances enjoy a wide vogue in the treatment of phthisis at the present time.

Schultz now comes to the discussion of serum therapy and organo-therapy. Under the former head tuberculin and several sera have been extensively tried, including the use of extracts of lung tissue.

The author next discusses those remedies which fulfill a single indication such as expectorants, haemostatics, antihydrotics antipyretics, etc., etc. Under expectorants, antimony and other nauseants, and sal ammo-

niac are mentioned. For haemoptysis an endless number of remedies has been used without any exhibiting special excellence. For colliquative sweats a large number of remedies has lately been brought forward such as thallium acetate, chloralose, camphoric acid, cotoin.

Most of the remedies in use against phthisical diarrhoea are old—bismuth, opium and astringents.

Antipyretics have been used in great variety. This group includes quinia, salicylic acid, benzoate of soda, alcohol. They were not very successful in bringing down the temperature, while the more modern antipyretics, however effective, are not adapted for continuous exhibition.

Schulz concludes by saying that when all these curative and symptomatic remedies fail to yield a hopeful result, we still have to prescribe for the pain and to that end must make use of narcotics, sedatives and hypnotics.

TUBERCULIN AND THE ROYAL DAIRY HERD AT WINDSOR, ENGLAND.

An annotation in the *Lancet* for April 15, 1899, contains the statement that the value of the tuberculin test has been well shown in one of the Queen's herds of 40 cows (mostly shorthorns and Jerseys without pedigrees). Of this number 36 reacted to tuberculin and the Queen gave permission to have them killed. The cows appeared to be uniformly healthy. The testing was done in September, 1897. Most of the cows (all but 4) had reaction fever after the inoculation and all but one were tubercular. Of the four which did not react, one presented on autopsy a caseous gland; and one cow which reacted was found to have a uterine affection but was not tuberculous. It was assumed that the herd had become infected from perhaps a single tuberculous cow. A new herd has been formed, each member being tested with negative results before admission.

SUPPLEMENT TO THE JOURNAL OF TUBERCULOSIS.

In this part the whole subject of Pulmonary Tuberculosis will be covered by a continued series of articles written by Dr. Karl von Ruck. Articles already in print will be revised, and republished, and others will be written new, appearing in the following order.

Article I.—The cause of Tuberculosis, and the conditions which predispose to its acquirement. Article II.—The Prevention of Tuberculosis. Article III.—The Clinical Course of Pulmonary Tuberculosis, with reference to its pathology and complications. Article IV.—The Diagnosis of Pulmonary Tuberculosis. Article V.—The Prognosis of Pulmonary Tuberculosis. Article VI.—The Treatment of Tuberculosis, dietetic, hygienic and symptomatic. Article VII.—The Climatic Treatment. Article VIII.—The Specific Treatment. Article IX.—Laryngeal Tuberculosis, its diagnosis and treatment. Article X.—Institutions for the Treatment of Pulmonary Tuberculosis.

THE PREVENTION OF TUBERCULOSIS.

(CONTINUED FROM PAGE 80.)

The sanitary cuspidors obtainable in the market are furnished with a special frame and lid which hold the paper inset, and can be commended for the convenience of patients in bed, and for the advantage that the lid prevents the access of flies.

The paper part of sanitary cuspidors should be burned with its contents. The metal frame and lid must be washed in a two per cent. solution of carbolic acid, each time when the paper part is changed; the same solution may be preserved for use upon several successive days if expense is an object.

The contents of other vessels may be thrown into sewers, or in their absence they should be buried after adding slacked lime; burning is undoubtedly the best method of disposing of collected sputum; the vessels are emptied upon sawdust or shavings, confined in a wooden box or other receptacle, and after adding kerosene oil the whole is ignited.

In private practice the washing and rinsing with boiling water of permanent expectoration-vessels is sufficient; but in hospital and institution practice, in hotels and boarding-houses of resorts where many tubercular patients go for climatic treatment, more thorough disinfection should be carried out.

This, I believe, is best accomplished by the addition of a powerful germicide to the water in the cuspidor.

After much experimenting, I find corrosive sublimate the best, being odorless and cheap. Solution of 1 part to 1000 should be kept

ready for use, and should be placed in the vessels in about double the quantity of the probable amount of sputum they are likely to receive.

After emptying, these vessels must be soaked and rinsed in a solution of corrosive sublimate, one part to two thousand; a specially kept wooden tub or large pail half full of the solution will answer very well. Several spittoons or vessels may be soaked successively in the same solution.

In rooms occupied by patients the large slop-jar which is, as a rule, part of the toilet set, should be preferred to smaller cuspidors. These jars are higher, have wider tops, are easily kept clean, and are accessible to more thorough inspection.

We should, however, not only demand the proper disposition of sputum known to be tubercular, but on the contrary the rule must be made general, and all sputum must be considered as liable to convey disease germs; no matter whether the patient is supposed to suffer from bronchitis, asthma, catarrh, influenza, pneumonia, diphtheria, measles or consumption.

All expectoration is a pathological secretion, and contains pathogenic micro-organisms, endangering the health and life of others and there can be no justice in discriminating, by tolerating the dangerous habit of promiscuous expectoration in one disease and not in another.

I have attempted to introduce the Detweiler expectoration flasks, but found such an unwillingness to carry and use them, that I gave up, believing that so long as we cannot get our patients to willingly use them it is better to give them paper napkins or cheap cotton handkerchiefs instead, to which they make no objection, and which are burned after being used.

In severely ill patients, and toward the close of life, when they become helpless, paper napkins and cloths are the only available receptacles for expectoration, and it is in this helpless state that the friends and nurses must be especially cautioned to exercise the greatest care and attention.

Most reprehensible is the swallowing of sputa, which some patients practice when there is no expectoration vessel near at hand, and all patients are liable to find themselves so circumstanced. Whatever we may say against handkerchiefs, under such exceptional circumstances, it is the only choice the patient has unless he spits upon the floor or swallows the sputum. Of the three evils the handkerchief is the least, and I recommend my patients to carry some paper napkins, special cloths, or very cheap handkerchiefs for such emergencies, which may

also be used to hold before the mouth during violent coughing, and for wiping their lips after expectorating. These napkins or handkerchiefs are to be used only for the purpose named, and when used they should be burned before they become dry enough to be a source of danger.

Occasional accidental soiling of something or other will occur in all classes, and even with the most sensible patients who are desirous of following all instructions. For such accidents, solutions of corrosive sublimate, or of other disinfectants, should be kept on hand and the patient or servants should be instructed in the importance of their proper and efficient use.

It being impossible to prevent the escape of every tubercle bacillus or other pathogenic germs in the apartments occupied by patients who expectorate, special care should be bestowed to the cleansing of such rooms and of their contents.

Such rooms should have either bare floors or movable rugs, instead of fixed carpets; and instead of sweeping with a broom the floors should be wiped with a moist cloth, and the furniture should be dusted in the same way; and the rugs taken out of doors for cleaning.

If the carpets cannot be removed, moist paper fragments should be freely strewn upon the floor, before sweeping with a broom, and in the use of the latter it is wise to sweep with open windows and with a counter current of air to carry the dust out of doors. Solutions of corrosive sublimate may be used for wiping the floors and furniture.

The presence of the germs in the mouth, after expectorating, makes it desirable to give patients an antiseptic solution for rinsing the mouth and gargling, to be used regularly after cough with expectoration; they should be particularly requested to so cleanse their mouth and throat, before eating. Simple water is probably all sufficient for this purpose, but more prompt and regular compliance with this advice obtains if we give a weak solution of some germicide flavored with an agreeable aromatic.

Frequent washing of the hands of consumptives is also a good rule to insist upon, and no food should be handled or taken by them without first cleansing hands and finger nails by the free use of soap and water. Men should be induced to dispense with large mustaches which overhang the lip, and which are almost invariably soiled when expectorating.

In most families we can secure separate dishes, eating and drinking utensils, and toilet articles for patients, and these should be distinguishable by their form, material, or color. When the friends seemed disinclined to provide them, I found them readily forthcoming on explaining

to them the danger they, themselves, were liable to in using such articles in common with the patient.

In the same manner we can insist upon separate washing of linen, and upon the use of boiling water for this purpose. In all these matters we must simply arouse the self-interest of the interested parties sufficiently to obtain compliance.

On the whole, patients are comparatively easily controlled when at home and indoors for we have the element of personal fear and of solicitude for the welfare of their friends to help us; but in our efforts to control them while away from the premises they occupy, when personal considerations and interests are less potent factors, and when supervision is absent, we meet often with great indifference.

With tuberculous discharges of other parts than the air passages nothing less than the strictest antiseptic methods of surgery should be permitted, with destruction by fire of all removed dressings.

Ordinances of town and city authorities against promiscuous expectoration in public places are desirable if for nothing more than to limit the disgusting habit of spitting publicly everywhere, and they are especially desirable in health resorts. The city of Asheville has made the first effort in this regard: in 1896 an ordinance was adopted by which public buildings and hotel corridors must be furnished with cuspidors to be cleansed and disinfected under the direction of the board of health. Expectoration upon sidewalks is also forbidden. Non-compliance involves a fine of one dollar.

This of course permits expectoration into the open street, but the real danger from such expectoration, if any exist, is a limited one, as under its exposure to sunlight the germ is not likely to survive long enough to become dry and enter the air as dust.

Compulsory disinfection of at least such rooms in which tubercular patients have died, and in time of all rooms which have been occupied by tubercular patients before they are used again, would commend itself to public opinion, and, I believe, could be readily obtained if the subject were persistently brought to the attention of the proper authorities.

The same is true of disinfection of sleeping cars or at least of their carpets, linen and blankets; and if a beginning could be made with sleepers running to popular resorts for consumptives, the extension of the method to all cars would follow in due time. But for all these and other reforms, the initiative must come from the medical profession, of which each and every member has his power and influence which if combined throughout this country could accomplish astonishing results.

Must we, indeed, invoke the element of selfish interest in our own ranks also, and is it necessary to point out the great number of lives which tuberculosis claims among us as a profession, and among the members of our immediate families?

It is self-evident that every physician and those whose interests are more particularly dear to him are equally exposed to the carelessness of our patients; and physicians who treat and visit such patients in their rooms are exposed almost as much, only for a shorter period of time, as are the immediate friends and relatives who occupy the rooms and house jointly, with careless consumptives.

A word of caution to dental surgeons, seems also in place here. Unfortunately dental surgeons are still ignoring the lessons and benefits which aseptic procedures in general surgery have taught and conferred, and to find a dentist who really disinfects or sterilizes his instruments would prove a rare exception.

All physicians familiar with the disease under consideration know, how rapidly the teeth decay under the general mal-nutrition accompanying it; and how frequently tubercular patients require to consult their dentists.

In health resorts like Asheville the larger part in any dental practice comes from visitors who are subjects of tuberculosis.

To think that instruments used in the mouth of other persons, tubercular or not, are cleansed by simply dipping them in a little cup of water, exceptionally, perhaps, containing a few drops of carbolic acid, and wiped with a cloth or napkin in common use, before being put into the mouth of the next patient, is revolting. We might as well consent to use tooth brushes in common with others. When, however, the patient has tuberculosis or syphilis, the practice becomes not only abhorrent, but dangerous.

Since the dental surgeon is not likely to make a diagnosis of the presence or absence of pathogenic micro-organisms in his patient's mouth, there can be but one method for him to pursue, and that is sterilization of all instruments before they are again used.

Most physicians would discontinue to refer their patients to dental surgeons who refuse to sterilize their instruments, if only there were those whom we could recommend because of their safe practice in this respect.

The question of marriage of tubercular persons might also receive consideration, although the prospect is slight that much benefit will result from advice against it. Nevertheless the family physician should

express his views whenever he is given an opportunity to do so, and should state in emphatic terms the danger of communication of the disease. By fully explaining this danger to the parents of young men or women who contemplate marriage with a consumptive, and by pointing out to all concerned the great probability that the children of such unions are almost sure to become victims of the disease, the sentiment against the contraction of such marriages will grow stronger, and in some instances at least, much sorrow and suffering may be saved.

Whenever tuberculosis is present in a family the greatest degree of separation possible of the non-infected should be secured.

Especially should the physician advise the removal of the infected person, to a special institution or hospital, and if possible at a time when there is still a good prospect for successful treatment.

If this cannot be accomplished, and the disease is advanced to the stage where expectoration is present, an effort should at least be made to remove young children from the house, by providing a temporary asylum with relatives and friends. The great disposition of young children to the acquirement of tuberculosis makes the usual preventive measures inadequate; and absolute separation is the only safe course.

More care should also be exercised in the employment of house servants, and especially of those who have the care of young children. It will be rare that such servants suffering from tuberculosis, will exercise sufficient care or have the necessary intelligence to exercise it, so that their presence in a family does not become a serious danger to the health of some of its members. A good rule is to employ no servants who have a chronic cough, and who expectorate.

The preventive measure for our protection against infection from animals can and should be more radical, and therefore more effective.

Before the advent of tuberculin, as a diagnostic agent, little or no attention was paid in this country to the danger which threatens us from tubercular animals; and the inspection of meats before they are exposed for sale is, except in some of our largest cities, still a matter of the future; though over 20 per cent. of all cattle and many swine suffer from tuberculosis, to say nothing of other diseases which make their flesh unfit for use. If non-interference on the part of the local or state government, with dangers which threaten the public health is part of its democratic policy, the parental policy of some European governments is to be greatly preferred.

The frequency of glandular tuberculosis in childhood, a period of life where milk forms a large share of the diet, the probability that pulmo-

nary tuberculosis in the adult is frequently secondary to the glandular form of childhood, the long periods of latency of tuberculosis, especially in the lymphatic and glandular structures, all seem to point to this source of danger. If it is true that in extreme northern countries where there are no cattle, or where they are scarce, tuberculosis is either not observed at all or is rarely encountered, the danger of infection through their milk and flesh becomes all the more a matter for serious consideration; although there may be other explanations possible.

Commendable progress has, however, been made in protective measures against infection with milk through the actions of several boards of health, particularly in Massachusetts and New York : and their example should be speedily followed in all states of the Union.

For the prevention of infection from animals we can more easily get proper legislation; and its effectiveness can reach such a degree that we need not question the result.

We must simply destroy these animals wherever found, and thoroughly cleanse and disinfect the stables and enclosures in which they have been kept.

To make a reliable test with tuberculin, the first condition is that the specimens to be used shall be of a known, uniform standard, which so far is by no means the case; a number of specimens of tuberculin imported by me from Germany, as well as those produced in my own laboratory, showed, in several instances sufficient variation in their power to produce fever reactions, that a certain dose of one specimen may fail to produce fever when tuberculosis exists, while a like dose of another may cause a fever reaction simply from its excessive toxic effect in the absence of tuberculosis. (1).

Before injecting the tuberculin, the animals are best kept in the stable or enclosure for 24 hours, and should there be thoroughly inspected as to their state of nutrition, presence of enlarged glands, and of kernels, and nodules in the lymphatics, and in the bags of milch cows. Their temperature is then measured every three hours in the rectum with strong, large self-registering instruments, which must be well oiled and carefully introduced. The number of respirations are counted and complete records are made of all that is observed.

Beginning this inspection at noon, we are ready to inject the animal to be tested late in the evening. Animals which show temperature above 102.5° F. must be excluded from the test, reliable results being doubt-

ful; and all such animals in which the diagnosis of tuberculosis has been made by the preliminary examination are also excluded.

The injections are best made with a strong syringe holding about 5 c. c.; for those who have occasion to test many animals, an instrument which admits of the use of a short piece of flexible rubber tubing between the needle and syringe will be found convenient, as there is less danger of breaking the needle in case the animal should be more or less unruly. The loose skin of the neck is the best point for injecting, and if the syringe is of sufficient size, a ten per cent. solution of tuberculin should be preferred.

The amount to be injected of a standardized solution is one-half cubic centimeter of the full strength (therefore 5 c. c. if the ten per cent. solution is used) for an adult animal weighing about 1000 pounds. Calves should receive one-fifth, yearlings two-fifths and heifers three-fifths of the adult dose, while very large animals such as oxen and bulls receive six or seven-tenths of a cubic centimeter of the undiluted tuberculin.

Since the reaction does not usually occur before the expiration of 12 to 18 hours, measurements of temperature are not required during the night; they should be made at intervals of three hours beginning nine hours after the injection, and continued until the expiration of 24 hours.

All animals which have shown an elevation of two and a half degrees, or maxima above 104° F. must be considered tubercular and they must at once be separated from the other animals.

Their milk should certainly not be used without being first boiled, and the like holds good of the beef if the animal is butchered.

Animals which are excluded on account of the presence of fever and those which reacted with only a slight increase of temperature should be suspected, and the test with a moderately increased dose for the latter should be repeated after a lapse of two or more weeks. Tubercular animals as well as human subjects which have been tested with tuberculin do not always give reaction when the injection is repeated earlier.

Apart from the actual presence of tubercle bacilli, the milk from tubercular cows may contain toxins which in small infants may cause serious disturbance by producing symptoms similar to those we can obtain from the injection of diagnostic doses of tuberculin in man.

May this not be at least one of the explanations for the frequently observed fact in infant feeding, that the milk of certain cows seems to agree better than that of others? Boiling of such milk or sterilizing it

would not materially interfere with the toxins it contains, since they are not destroyed or changed by a boiling temperature.

Among the bovine species, the disease is believed to spread chiefly through faecal matter, and secretions from the air passages; the milk may also convey germs to the calf, but calves are not as frequently found to be tubercular as are adult animals. Tuberculosis once established in a herd of cattle, the greater number become eventually infected.

In the absence of national or state legislation individual communities do not need to wait for its accomplishment. Every city or town government and every board of health can inaugurate this protection for its own locality; and the resident physicians should have sufficient influence if persistently and earnestly asserted to obtain the necessary ordinances.

There is, however, a special duty on the part of the State, which it cannot escape on the grounds of "interference with individual rights," which is claimed would result, should there be laws enacted and enforced to prevent the spread of consumption.

I refer to the responsibility of the State in its duty to those whom it has already deprived of their individual rights, and from whom it has taken the means of self-protection against the acquirement of the disease by enforced confinement in public institutions, such as lunatic asylums, poor houses and prisons, and for whom it frequently fosters conditions which favor the acquirement of tuberculosis.

As to lunatic asylums, the reports from such institutions show a great prevalence of pulmonary and other forms of tuberculosis, and as an illustration of it I quote from a paper of Dr. J. W. Babcock, superintendent of the South Carolina Institution, on "the Prevention of Tuberculosis in Hospitals for the Insane," (1) as follows:

"Careful observation and inquiry show, that the disease prevails in some wards of the old building erected in 1822, and now occupied for the most part by colored women; in the section of the new building erected in 1856, now assigned to white men, and in certain wooden pavilions occupied by colored men and women. The remaining 18 wards for white men and women are free from the disease. Prior to 1868 few negro patients were admitted and records of phthisis are rare; since that date there has been a steady increase in deaths from tubercular disease. In 1883 with an average population of 564, there were ten fatal cases of tuberculosis, while in 1893, there were thirty-nine deaths from that cause in an average population of 764. That is in the decennial period

(1) American Journal of Insanity, October, 1894.

the population increased 35 per cent. and the mortality from tuberculosis 290 per cent."

The fact that this enormous increase in the mortality is chiefly in the negro race, and that these negroes are confined in the infected old buildings and pavilions, of which Dr. Babcock says that the bed-rooms are small, poorly lighted and ventilated, and that from a modern sanitary standpoint these buildings are typical of what they should not be, shows the relation of unsanitary condition to the spread of the germs on one hand, and the frequency of infection under such conditions on the other.

The disease being also prevalent in the building erected in 1856, before much attention was bestowed upon sanitary requirements, and which is occupied by white men, proves, that both white and colored people are influenced by the same conditions, the remaining 18 wards of modern construction being free from the disease.

It is quite similar, and perhaps worse in poor-houses, and in penal institutions, in a large number of which the hygienic conditions are lacking in many and often in almost all directions. We find, therefore, that these institutions show an enormous mortality from the disease; and the frequency of its development appears to stand in relation with the duration of the time of confinement, under which the resisting power becomes reduced from want of out of door life, from poor or insufficient food, and from the moral depression incident to the mental disease, or the sense of degradation and shame of poverty, crime and association.

The subject of prevention of tuberculosis among such unfortunates, becomes thus a most serious one, for the consideration of State authorities and for those who have charge of the administration of our laws.

If, as in the South Carolina institution, the insane inmate is almost sure to contract the disease, by reason of the infection of, or the unsanitary condition of certain buildings, or if the sentence to confinement in a penal institution for a term of years may in fact be a death sentence, especially if the prisoner is already predisposed to, or if he suffers from the disease in a latent form, there is certainly a plain duty on the part of the State; namely, to use every precaution that is possible, under existing circumstances, to prevent such an occurrence, and to guard the health of those whose mental disease requires their removal to special State institutions, whose poverty and infirmities make them objects of public care, or even of those for whom it seeks the accomplishment of moral reform.

The provision in either case of a sufficient quantity of pure air, and sunlight, and of out of door life and exercise, of enough wholesome food,

the enforcement of bodily hygiene, and of preventive measures, the disinfection of rooms, especially of hospital wards, the sanitary perfection and improvement of the buildings in all details, are duties which the State should not ignore though it may have no direct responsibility to those who suffer from neglect. The non-compliance with this duty makes it doubtful, or at least debatable, whether in case of crime, and its punishment, society has been the gainer, if at the end the prisoner is discharged a hopeless consumptive, scattering infectious material during the rest of his life.

The foregoing propositions for the limitation of infection with the specific germ have all been made, again and again, by others, and by myself; and similar, perhaps better measures will come up for consideration in the future, but it seems that if sanitarians were to spend less time in contemplation of the exact amount of good to be eventually derived from one method or the other, or from possible modifications and improvements in their details, and would begin to act by strongly insisting upon a course which in the light of our accumulated knowledge and experience appears reasonable and feasible, we, ourselves, might hope to see the time when the fruits of our labors would appear in an appreciable reduction of the mortality from tuberculosis.

While our direct preventive efforts are taken against the tubercle bacillus itself with a view of its destruction or of preventing its entrance into the living body, we should also take advantage of less direct means for preventing or restricting infection, consisting in measures calculated to increase the natural resistance of such who are already predisposed to the acquirement of tuberculosis, and further in preventing the acquirement of the predisposition itself by those now fully resistant, and by future generations.

In these efforts we must necessarily fail in all those instances where the constitution is premanently impaired, or when the peculiar vulnerability of tissue by reason of heredity, is so great, that the task of changing it to one of sufficient resistance is beyond our power.

Such subjects we may still seek to protect by advising an out door life in rural districts and elevated regions where they are least likely to meet with infection, but in all cases the preventive measures should begin in the earliest infancy.

The many difficulties which we must encounter in attempting to raise the resisting power to tubercular infection in at least one-half, if not more, of all people, appears upon most cursory examination—and even those who are but slightly acquainted with human nature will see at once,

that inasmuch as success will almost entirely depend upon voluntary action there will be comparatively few, who will consistently follow the course which will eventually accomplish an appreciable result.

Most, if not all people, are ready to admit that a mode of life and conduct under which the greatest possible vigor and vitality shall be secured and maintained is highly desirable; that true happiness as well as the comforts and pleasures of life can only be obtained and fully enjoyed in the presence of good health, that the want of such vigor and vitality of body and mind is a great hindrance if not an absolute bar to success in life in any direction, and that our propositions for their attainment and continuance are excellent and should be accepted and acted upon by everybody.

Yet the degree of will power, and self-restraint to cause proper action are possessed, at the present, by a small minority only. With others the admission of the truth and perhaps a good resolution never to be followed by consistent action, or to be disregarded sooner or later, is all that is attainable.

Discouraging as this may appear, we should not forget that it was only the continued advocacy in the past of what is just and right to self and others that has made the present advances possible, that growth in such matters in the right direction is slow, that it would probably cease entirely or become retrogressive if we should stop fostering it.

Although consumption is a disease uniformly feared by all people, there are few who do not expect to escape it, and even if we should be in possession of a sure and harmless method of vaccination against its contraction, such as we have for small-pox, there would be an equally slow appreciation of its benefits and many, if not a majority, would delay in protecting themselves until the danger is imminent; or what would be more likely, they would be overtaken unexpectedly.

If such is the course of human action, we must expect still less, when we demand so much in the exercise of will power, and self restraint, of which the majority of men are still seriously lacking.

At the present time we can only deal with some of the more patent factors which favor the acquirement of tuberculosis and for the removal or eradication of which we have some reason to believe that our advice will meet with more or less compliance.

To begin with those who can be presumed to have inherited a predisposition to the acquirement of tuberculosis, because of the physical degeneration of their more immediate ancestors, manifest in one or both parents by their contraction of tuberculosis, or of other severe chronic,

exhausting disease, we find that such predisposed individuals do not necessarily betray their diminished resisting power during the period of development and growth; and that many children of such parentage grow to adolescence or to early man or womanhood with apparently good health.

Frequently, however, we note evidence of faulty nutrition at an earlier period. The children are delicate, and weakly, and though often bright and intelligent, the physical development is retarded, in one or several directions; often there is an early and persistent tendency to catarrhal affections, sickness is usually severe, and convalescence protracted; glandular and lymphatic engorgement or enlargement of visible glands is not uncommon.

It seems probable that many of such so called delicate children are in fact already suffering from tuberculosis of the lymphatic system, and that the delicate state of health and nutritive deficiencies are an expression of the latent or obscure disease; while those who grow up with apparently good health, and break down as young adults, escape infection until a later period.

In all such predisposed subjects preventive measures should begin at the earliest period; and even during gestation every effort should be made to improve and maintain the mother's physical condition.

If she is tubercular, she should not nurse the child, not because of danger from her milk which rarely contains tubercle bacilli, but for her own sake; as the drain upon her by lactation will favor the progress of her own disease though it may be in an early or latent stage.

If she is so far advanced in the disease that her sputum contains the specific germ, then she is exceedingly liable to infect her child under the close contact which must necessarily exist.

A tubercular mother in a stage of the disease where there is expectoration should not only not nurse her child, but should have little or no contact with it; and if the child cannot be entirely removed from the home and given in the care of healthy persons it should be kept out of her room, and should under no circumstances be permitted to lie, creep, or play upon her bed or upon the floor; the danger of its infection being altogether too great, even if ordinary precautions as to the disposition of sputum are observed.

The excess of tubercular disease in the children of consumptive parents as compared with those in which the inherited predisposition is due to other diseases, is undoubtedly in part owing to infection in early childhood with the tuberculous discharge of the parent.

The general rules of infantile hygiene must be especially observed in predisposed children, particular attention being given to proper food and clothing, and to out of door life when the weather is favorable; their rooms should be sunny and well ventilated when kept in doors.

Well regulated exercise of the muscular system, especially if practiced in the open air, is one of the most important preventive measures against the development of phthisis and its benefits are universally conceded. The good results from it have been so uniform in predisposed subjects, and also in such as already suffer from the latent disease, that the observation has erroneously led to the adoption of severe physical exercise in the existing active disease, with much detriment to such patients.

The invariable increase of general muscular growth and strength under regular exercise is highly conducive to increase of all the nutritive functions, through stimulation of the entire circulatory apparatus, and of the nervous system, which is followed by increased oxidation, elimination and absorption in all organs and therefore by better appetite, and by better sleep. By its employment the respiratory apparatus is especially called into activity, the ventilation of the lungs becomes better, the chest movement become free and easy and the vital capacity increases; complying thus with the well recognized principle that perfect functional activity of organs is essential for preserving their structural integrity.

Children up to the age of adolescence need rarely to be urged to take such exercise. They obtain it in all essentials by their out of door sports and amusements; but a wise supervision by parents or teachers to prevent excessive fatigue is frequently necessary, and special provisions for maintenance of such exercise in inclement weather and during the winter months are essential.

A large, well ventilated play-room can easily be provided by parents who can afford it, people who are limited in means should furnish whatever sunny room they have in the house for this purpose.

The use of special gymnastics with the view of more particularly developing the muscles of the neck, shoulders and chest will be found useful in those cases in which there is a tendency to drooping shoulders, or in which the physical development of the chest is faulty.

Such exercise requires the supervision of a competent teacher who understands the anatomical and physiological relations, without which the practice is not of sufficient interest to be carried out frequently and persistently; nor is it likely to accomplish the object. For a more partic-

ular description of such supervised exercise the reader is referred to Dr. Butler's paper (1) on "Exercise as a Preventive of Phthisis."

The special kinds of general exercise must of course depend upon the age of the child, as well as upon time and season. Bearing in mind the object of muscular development and growth in connection with the inhalation of pure air, it is easily adjusted to the particular case and to the attending circumstances.

If children are expected to be benefitted from exercise their clothing must be loose so as to permit freedom of action, and especially should there be no constriction about the chest and waist, a matter to be watched in all cases, but particularly in girls. The material for outer garments may vary to suit tastes and ideas, but next to the skin it should be wool, and however thin the fabric may have to be for comfort in warm weather, this is essential throughout the year.

When the age for attending school arrives the physical development must have precedence over mental training; and with the class of children under consideration, it is often best to delay the attendance of public school until they are a few years beyond the period when this is usual.

No home or night study should be permitted, when the child is regularly attending school, and every hour of favorable weather should be spent out of doors in play and physical recreation.

It is far better that an extra year shall be spent in the mastering of the elementary branches, under the careful fostering of physical development, than to arrive at the age of puberty a delicate, though very bright child.

The hygiene of the school room is also a matter of great importance, and a teacher's certificate should be a guarantee that the holder is acquainted with the principles of hygiene, while all superintendents of schools should be proficient in its theory and practice, and be required to conscientiously enforce it.

When the period of adolescence is reached, we are apt to look upon the continuance of out of door play as childish or frivolous; but regular, moderate, and systematic out of door exercise is ever a safe-guard in the maintenance of good health for all people, and at all ages; skating, walking, horse-back riding, dancing in the open air, and other out of door sports short of excessive strain and fatigue should be encouraged in both sexes, and according to the particular choice and age of the individual, such exercise in one or several forms should be cultivated even after the period of greatest danger is passed.

In thus insisting on the value of exercise, we should not forget the necessary rest, and opportunity for recuperation in sound sleep. Especially in growing children and young adults the hours for sleep must be liberal, and an early hour for retiring is essential.

The predisposed individual should from early childhood have a daily bath in cool water, at a temperature not exceeding 80° F. and with the increasing years the temperature of the water should be gradually lowered to 60 or even 55° F. according to the readiness with which the circulation reacts to the degree of cold applied. Even with very small children of an age from one year and upward, it is conducive to vigor and preventive of contracting cold, to gradually reduce the temperature of the daily bath below that of the body.

Since pulmonary tuberculosis develops in an active form most frequently in young adults, the extra precautions for the predisposed should not be relinquished until after the age of 24 or 25 years, when if the proper measures have been conscientiously observed, and a proper choice in occupation has been made, the danger of its subsequent contraction grows less.

The proper selection of boarding schools for predisposed young girls and boys is a subject of great importance, and an unfortunate choice may entail conditions beyond remedy and repair.

With its educational and moral advantages, the location in a comparatively good climate, the quantity and quality of food supplied and the physical training offered incident to education, should have at least equal consideration.

The food is all important even for those who are not specially predisposed to disease, and by its deficiency, or by its poor quality, at a period when the organism is in its greatest nutritive activity, and makes therefore the greatest demands, the predisposition to tuberculosis may be readily acquired.

But if the individual is already predisposed or suffers perhaps from the latent disease, and if there is not a sufficiency of good and palatable food at this time, all previous efforts will likely prove insufficient in preventing the actual outbreak of the disease.

Many boarding schools for boys and girls receive pupils at rates, which are so low, that "good feeding" is simply impossible, and while I am in sympathy with all educational efforts, I believe that there are few instances in which the pupil's interests would not be better served by dispensing with the services of such cheap schools. In this belief I am justified by my experience with a large number of young persons, especially

girls, whose decline in health, and the advent of tubercular lung disease appeared to stand in relation with the poor and insufficient food at their boarding schools.

If higher education is within their reach, it should never be pushed in predisposed subjects. More time should be given for its completion than is usually provided in the curriculum of our colleges, in the conscientious compliance with which there is an implied amount of indoor study and labor, which would in itself seriously endanger the youth's health. If to this is added the disadvantage of late hours, spent in social enjoyments, or perhaps in dissipation, the escape of disaster becomes simply a matter of fortunate accident.

In the choice of occupation, one which assures the largest share of out of door life, but with a possibility of avoiding exposure to inclemency or to severe extremes of weather, gives the greater prospect for escaping the disease and this prospect is increased the more favorable the general features of the climate of the locality may be.

In the choice of any calling the probability of success or failure, with the mental state thereby induced as to contentment, or worry and anxiety needs to be considered; and it is not advisable to force or coerce a youth into a pursuit for which he has no interest or inclination.

In individual cases the social status of the family, and their financial resources will enter largely into the particular choice. In a general way, all those occupations which assure the greatest freedom from nervous strain and worry, and under which a residence in a dry, salubrious climate away from the crowded cities and densely populated districts is possible, are to be preferred: while those which favor affections of the air passages from inhalation of irritants and dust, or the acquirement of actual infection should be strictly avoided.

The professions, if eventually to be practiced in rural districts, may be classed with the favorable occupations, the greater danger to the individuals being rather in the college preparation than in their pursuit. They also allow much choice as to climatic advantages, and we indeed find many members of the medical, legal and clerical professions in active pursuit of their vocations in sections and states in which the climatic conditions are highly favorable, who have been either predisposed or have at one time given evidence of the presence of actual tubercular disease of the lungs. The immigration of predisposed individuals and families from unfavorable to relatively better climates before sickness overtakes them should be much encouraged, and advised whenever occasion presents itself.

In this respect the territory of the United States offers a large choice, which, however, must often depend on finding means for support. While popular sections for the climatic treatment of phthisis may also be considered for predisposed persons, the presence there of many actual sufferers from the disease must be thought of, especially in the absence of proper preventive measures for the spread of the disease. Apart from such popular resorts, there are many less celebrated sections in which the predisposed subject will find the essentials for his purposes, and often with less sacrifice in expense for travel and with even better opportunities for making his way.

Locations having a dry soil, short and mild winters, and no great extremes in temperature, where out of door life, and during most of the entire year open windows and doors are consistent with comfort, where the cost of living is less than at popular health resorts, seem to me to meet every requirement of protection as far as climate is concerned.

If land is cheap many mechanics may find it equally profitable to learn to follow agricultural pursuits instead of continuing in their particular employment in towns or cities.

Such localities exist particularly in some of the Southern States, and large areas, as for instance the celebrated Piedmont section are offering advantages incomparably better than we could possibly find in the eastern and middle States, where the climatic conditions of at least some portions are highly unfavorable, and where land is comparatively dear.

People who for any reason cannot or will not seek better localities may still improve their conditions in their own State or in their more immediate section of country, and striking differences in healthfulness, especially with reference to dampness of soil and air, may often be found in the same village or town.

The dwellings of the laboring classes are too frequently located without regard to considerations of healthfulness, and those who will not or cannot consider more distant advantages should at least seek dwellings situated on comparatively dry soil, with cellars that can be ventilated, and with plenty of opportunity for sunlight, and they should particularly avoid houses in which a consumptive has recently lived or died, unless the house has been well disinfected.

In our more direct professional relation with predisposed patients we must be very watchful in the care we give them when ill, even of the supposed slighter ailments, and especially when the affection is one which involves the bloodmaking, digestive, and respiratory organs.

Many times we have occasion to observe that such patients are more

severely affected by a cold, or an attack of diarrhoea than others, and betray a lesser degree of resistance and recuperative power when ill, which may not have attracted attention in their usual state of health. If their illness should drift into a prolonged or chronic course, resistance to infection becomes necessarily still further diminished, and their increased liability to readily contract tuberculosis exists over a correspondingly longer period of time.

Thus we see that anaemia, or chlorosis of young girls, or the infectious and contagious diseases of childhood, and typhoid fever in young adults, often precede the advent of tubercular disease of the lung either because of infection occurring during their existence and during retarded convalescence, or because a latent tubercular deposit has been excited to activity by the inflammation in the lung, or by the failure of the general nutritive processes.

It is not always easy to distinguish between those who are simply predisposed, and those who have already succumbed to infection; in practice it is often impossible, when such patients come under our care for the first time. In such cases it is however best to adopt every precaution which we would for the predisposed, and for those with latent tuberculosis, until a full convalescence shall be permanently established.

Whatever view may be taken as to the relation of scrofulosis and tuberculosis, there is no room for controversy that scrofulous children become subjects of pulmonary tuberculosis more frequently than do others, and this fact alone would justify us to consider them most strongly predisposed to the appearance of the disease in the lungs.

Every measure, therefore, which has been suggested for the eradication of the inherited predisposition must be most rigidly carried out if scrofulosis exists in any of its forms, and even those who doubt its identity with true tubercular disease, will do well to give such advice and care for that class of patients, under which they are on the side of safety.

In all cases where there is so-called scrofulous disease of the glands, joints or bones, we must insist upon their tubercular character, and upon the infectious nature of discharges coming from them, and in addition to their proper treatment, we have the problem of preventing extension of the disease to the lungs or to other vital organs.

When the radical removal of all tubercular tissue is possible this is of course the best preventive measure. The difficulty in those cases is, that as a rule, the local and accessible tubercular process is not the only one present, and while we are extirpating a tubercular gland or removing a carious portion of bone there are in all probability other tubercular

localizations which are beyond our recognition, and therefore beyond surgical relief.

While this is true, I still believe that early surgical removal of tubercular glands in the neck is particularly indicated on account of the danger to the lungs which, in many cases that have come under my care, became apparently implicated by a downward extension of the glandular disease until the upper lobe of the same side became also involved. In tubercular affections of bones and joints except in their early beginning, and before destructive changes have been initiated, only surgical measures offer any prospects for life or limb.

If surgical aid is not feasible and suppuration is present, we must still endeavor to protect the patient against further infection with his own discharges, by observing the strictest, aseptic precaution in the local treatment.

Dissemination, through absorption of tuberculous material we must seek to prevent by free drainage and by all those general measures which we would employ if the disease were of the pulmonary form.

The occurrence of pleurisy, whether dry and circumscribed, or acute with exudation in predisposed subjects may invariably be considered as tubercular; unless the contrary is absolutely proven, and, even if occurring in connection with other acute diseases in patients whose family history is faultless it is still best to follow a course which can bring the greatest benefit, and do no harm. No matter how well the patient may apparently have recovered from a pleurisy which justifies us to suspect tuberculosis, our advice should be the same as we would give a patient with latent or arrested tubercular disease of the lungs.

For prevention of the acquirement of the predisposition to tubercular diseases we can lay down the rule in a few words, by stating: that those who have been fortunate enough to inherit a strong, and vigorous constitution, and who would protect themselves further against its loss, must simply live a perfectly normal physiological and moral life, and if they would transmit such an heritage to their posterity, they must secure a husband or wife morally and physically their equal.

Although the contemplation of such a course by many people is, at this stage of human thought and action, a chimerical fancy, and its ordinary adoption a matter of the distant future, yet since men have on the whole grown better, in all directions leading to an ideal life, and the minority, however small, which are approaching it must be on the increase, its suggestion may be pardoned.

(TO BE CONTINUED.)

THE JOURNAL OF TUBERCULOSIS.

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THE CRUSADE AGAINST TUBERCULOSIS.

The paper by Dr. Denison, of Denver, published in another part of this number is timely and should at least call forth the views and experiences of the specially qualified members of the profession on the various subjects proposed for study and investigation, and communications on these subjects will be especially welcomed to the original columns of this journal.

That the bacillus of Koch is the direct and only cause of tuberculosis appears well established, and the dictum "without Koch's bacillus no tuberculosis" will undoubtedly stand.

The indirect causes which favor the localization, growth and continuance of the germs are manifold, and while some authors believe that all depends upon the mode and degree of infection, there are few practical observers who do not insist that the individual resistance of the organism plays an important part.

As to such favoring or opposing conditions for infection which obtain when we come in contact with the infectious material, we can instance the difference which would result when tubercle bacilli are simply deposited upon the external integument, or actually enter the interior.

In the former instance, no infection would probably follow, the chances for infection would be increased if the germs fell upon an abraded surface, and they would be further increased if friction was applied and the germs were actually pressed into the abraded surface.

In the latter instance the presence or absence of integrity of the epithelial layer of the mucous membranes, the amount of and the chemical constituents of normal or abnormal secretions, the readiness with which the germs may again be discharged outward or be retain-

ed, the motion of the part, etc., all determine the liability for colonization of the germ.

But after having made due allowance for all such and similar influence, there is forced upon the practical observers the conviction that beyond all of them, there is another determining influence, which in the absence of more accurate definition, we call predisposition, and which not only influences the occurrence of infection but has a bearing upon the course of the disease as well. The nature of this predisposition we believe to be a matter of quality of the tissues of the individual, and this quality we believe to be influenced and determined by heredity as well as by more or less temporary, external and internal influences, which operate upon the individual, especially during the period of growth and development ; but also in the subsequent periods of life.

Degeneracy means diminished resistance, and the causes for it are both moral and physical.

To go to the root of the evil means nevertheless both the prevention of access of the tubercle bacillus to the living organism, and the eradication of the inherited or acquired degeneracy. To attain the former we require general instruction of the public, the enforcement of well known sanitary and preventive measures, isolation of infected persons, destruction or safe disposition of tubercular secretions, testing of infected animals and such disposition of them that they shall be harmless.

To eradicate the predisposition, i. e. to bring about a reverse from degeneracy to improved and perfect types, means to control marriage and procreation on the principles of selection—it means to change from the present social status to one in which a normal physiological and perfectly moral life would be the rule instead of the exception, and it is not difficult to see from which of both courses the greatest amount of salutary influence may be expected in the near future, although the crusade should proceed on both lines.

One object of this proposed systematic enquiry should be to establish the relation of syphilis to the predisposition to tuberculosis not only in the syphilitic subjects, but in their progeny, and even in second and third generations.

We are fully impressed that interesting and valuable evidence would

follow a full investigation of this question, which might well be begun with the negro race, in which, it is the common assertion of old practitioners in the South, that prior to their emancipation tuberculosis was very rare and that syphilis was not at all common, while now the reverse appears to be the case. The negroes, especially those living in towns and cities, suffer from syphilis to an enormous extent, and tuberculosis has become one of the most frequent causes of death among them ; and both diseases follow as a rule a rapid and severe course.

ORIGINAL CONTRIBUTIONS.

THE WIDAL REACTION IN TUBERCULOSIS.

BY DR. S. H. VON RUCK, OF ASHEVILLE, N. C.

In the fall of 1897, while reviewing the records of patients treated for pulmonary tuberculosis at the Winyah Sanitarium, I noticed that in no instance had typhoid fever co-existed with the tubercular disease. The records referred to extend over a period of nearly ten years; and furnish a mass of clinical data embracing more than two thousand cases.

During this time numerous outbreaks of typhoid fever had occurred in the city of Asheville and its vicinity ; and it is scarcely reasonable to infer that not one of so large a number of patients was exposed to infection with the Eberth bacillus. It is true that the city water supply was pure; and that the cases of typhoid which developed could be traced to other sources (viz. the water of wells and of springs in the neighborhood of the town); but inasmuch as many of these tubercular subjects while going about on short excursions into the surrounding country, must necessarily have taken of water other than that furnished by the city, the fact that no case of typhoid fever developed among them may be considered as of significance.

This observation, coupled with the fact that the diazo-reaction, more or less frequently obtained with the urine of typhoid patients, is also occasionally seen in that of individuals suffering from tuberculosis, led me to suspect that possibly some relation might exist between the two diseases. Naturally the questions arose :

1st. Are there changes produced in the blood and tissue fluids of the body by the presence therein of products of the tubercle bacillus which exert a protective influence against infection with the germ of Eberth?

2nd. May the Widal reaction be obtained with the blood of tubercular patients ?

3rd. If the reaction is obtained with such blood may it be employed as a diagnostic means in tuberculosis ?

4th. Would such a reaction detract from the value of the Widal reaction as applied in typhoid fever ?

Accordingly, with the view of establishing the truth or fallacy of these theories, a series of experiments were undertaken, in which valuable assistance was rendered by Dr. W. L. Dunn, now of Decatur, Ill., but at that time in charge of the bacterio-therapeutic laboratory of the Winyah Sanitarium.

Pure cultures of the bacillus of Eberth were secured from the hygienic laboratory of the University of Michigan through the kindness of Mr. H. H. Waite, the demonstrator of Bacteriology in that institution.

Just at this time there were several cases of typhoid fever in the wards of the Mission Hospital of the city, and with the permission of Dr. W. D. Hilliard, then visiting physician to the hospital, I obtained blood from these patients with which to control the results of my work with the blood of tubercular subjects.

In all, some sixty tests were made and these were divided into four classes, as follows:

Class A—Trials made with blood from well marked cases of typhoid.

Class B—Trials made with the blood of individuals who had never had typhoid fever, and who were, as far as could be determined, free from tubercular disease.

Class C—Trials made with the blood of tubercular patients who had never had typhoid fever.

Class D—Trials made with the blood of patients suffering from tuberculosis and with a previous history of typhoid.

For each test a pure and virulent bouillion culture of the Eberth bacillus was used. These cultures were grown in the incubator at a temperature of 37.5° Centigrade ; and in no instance was a culture employed which exceeded the age of eighteen hours. The dilutions were the same for all, and consisted of one part of blood to ten of the culture fluid containing the germs. Dilutions of one to twenty were also tried ; but as no material gain resulted from their use, I shall confine this report to observations made with the one to ten dilution only.

The results of investigations made were so uniform that a detailed account of a limited number of cases only will be given in each class.

CLASS A—BLOOD FROM TYPHOID PATIENTS.

Case I. Five minutes—Agglutination well begun ; movements of bacilli considerably impaired. Ten minutes—Clumps of germs materially

increased in size ; some show little or no motion and movements of isolated germs have become sluggish. Fifteen minutes—Numerous clumps formed, in the great majority of which no motion could be detected. An occasional isolated bacillus may still be seen moving.

In a quarter of an hour the reaction was complete.

Case II. Five minutes—Small clumps in which motion is much diminished ; while many scattered germs remain more or less actively motile. Ten minutes—Agglutination materially advanced. Fifteen minutes—Absolute cessation of motion in clumps ; one or two free germs moving slightly. A typical Widal reaction.

Case III. In this instance a thorough agglutination took place within fifteen minutes ; but cessation of motion was not as complete as in the two cases above described.

Case IV. Here small clumps formed within three minutes. After fifteen minutes there were numerous germ masses, varying in size and shape, in none of which was the slightest motion perceptible ; while a thorough inspection of the field revealed but a single, feebly moving bacillus.

In the four cases described under Class A it will be seen that with a dilution of 1—10 a complete reaction occurred within fifteen minutes.

The results in the three remaining groups were carefully controlled—since with each test simultaneous observations of typhoid blood were made with a second microscope.

CLASS B—BLOOD FROM INDIVIDUALS FREE FROM TUBERCULOSIS AND WITH NO PAST HISTORY OF TYPHOID.

Case 1. Fifteen minutes—No semblance of a reaction. Thirty minutes—A few clumps of six or eight germs each have formed in which motion is diminished ; elsewhere movements are active. Forty-five minutes—Slight increase in size of clumps ; lessened motion throughout. One hour—Clumps small and showing sluggish motion. Vast majority of bacilli remain scattered with motility impaired.—No reaction.

Case II. Fifteen minutes—Nothing. Thirty minutes—Small clumps of 4 to 6 germs, but no apparent influence on motion. Forty-five minutes—Clumps slightly larger ; germs all moving more or less actively. One hour—Motion considerably diminished in some clumps, but elsewhere active.—No reaction.

Case III. Fifteen minutes—Some little tendency to agglutination. Thirty minutes—Small clumps in which movements persist. Isolated germs moving throughout. Forty-five minutes—Same as last observa-

tion. One hour—Still some motion in all clumps; free germs all moving, though some in a sluggish manner.—No reaction.

Case IV. Fifteen minutes—No sign of a reaction. Thirty minutes—Small clumps of three or four germs showing diminished motility; motion of scattered bacilli not noticeably lessened. Forty-five minutes—Clumps larger, some containing eight or ten germs; but motion has not ceased in them, and is still active in the isolated germs. One hour—Some motion present in clumps; a little less active in other germs.—No reaction.

In the cases recorded under Class B there was no beginning of agglutination within the first fifteen minutes. The clumps which formed later were all very small and in none of them, even after an hour, was there cessation of motion; while in the vast majority of bacilli, which remained free in the field, motility continued more or less actively.

CLASS C—BLOOD FROM TUBERCULAR PATIENTS WHO NEVER HAD TYPHOID.

Case I. Fifteen minutes—Agglutination considerable; in many clumps motion greatly diminished. Thirty minutes—Clumps large—in almost all of them perceptible motion exists only in peripipheral germs. Forty-five minutes—Masses of bacilli much larger, many quite stationary; while others show slight peripheral movements. Motility of isolated germs markedly lessened. One hour—In a large majority of clumps no motion to be detected; in the rest, while the central mass is immobile, an occasional peripheral germ is moving slightly. Few bacilli remain free; and these moving feebly.—A modified reaction.

Case II. Fifteen minutes—Agglutination begun. Thirty minutes—Clumps larger with little motion evident in them. Forty-five minutes—Clumps grown to quite large proportions—many stationary; others showing slight movements. Generally impaired motion of isolated germs. One hour—Cessation of movement in most clumps—some peripheral motile germs, an occasional free germ moving weakly.—A modified reaction.

Case IV. Fifteen minutes—Small clumps formed. Thirty minutes—Extensive agglutination, some masses showing scarcely any movement. Forty-five minutes—Increased size of clumps, some stationary, others showing a little motion. One hour—Clumps large, the great majority absolutely at rest; some with peripheral motile germs. But few isolated germs remain, and these are by no means active.—A modified reaction.

Case V. Fifteen minutes—Agglutination begun. Thirty minutes—Clumps growing in size; but motion still prevails. Forty-five minutes—

Some germ masses show only the peripheral movements. One hour—Clumps large, many stationary ; others oscillating. Activity of isolated germs, lively in some, in others sluggish.—A modified reaction.

Case VI. Fifteen minutes—Small clumps formed. Thirty minutes—Many clumps, increased in size and showing sluggish movements. Forty-five minutes—Peripheral motion only in some bunches. One hour—Absolute cessation of motion in many clumps ; in a few oscillating movements continue. Scattered germs few in number and in varying states of activity.—A modified reaction.

Case VII. Fifteen minutes—Agglutination well started. Thirty minutes—Clumps have attained very fair proportions, many of them showing movements of peripheral germs only. Forty-five minutes—Numerous masses stationary. One hour—No motion whatever in the great majority of clumps ; individual germs free in the field moving slightly.—A modified reaction.

Case VIII. Fifteen minutes—Agglutination begun. Thirty minutes—Clumps of much larger dimensions ; persistence of motion ; but many clumps show only movements of the oscillating character, due to activity of individual motile germs about the periphery. Forty-five minutes—Some clumps completely at rest ; others moving slightly. Movements of isolated germs becoming sluggish. One hour—Absolute cessation of motion in nearly all germ masses. Free germs fewer and more or less inactive.—A modified reaction.

It will be seen that in Class A, a typical reaction took place within fifteen minutes whereas in Class B nothing which could be considered as a reaction occurred, even in an hour's time. Now if the cases belonging to Class C be compared with those of the two former groups it may be noted that to some extent in all of them agglutination was apparent within a quarter of an hour ; further that the clumps which formed were of large size, and that a marked degree of impairment or cessation of motion followed in periods of time varying from thirty to forty-five minutes—and finally, that the reactions were complete by the end of the hour.

CLASS D—BLOOD FROM TUBERCULAR PATIENTS WITH PREVIOUS HISTORY OF TYPHOID.

Case I. Typhoid ten years before. Fifteen minutes—Small clumps formed in which motion is considerably impaired. Thirty minutes—Germ masses increased in size ; some showing but slight motion. Forty-five minutes—In many clumps peripheral motile germs only. One hour—Complete cessation of motion in a great many clumps, others

show movements of bacilli at the edges. Isolated germs few ; and show impaired motility.—A modified reaction.

Case II. Typhoid twelve years before. Fifteen minutes—Some little agglutination ; motility considerably influenced. Thirty minutes—Some clumps stationary ; others show motion of peripheral bacilli ; isolated germs less active. Forty-five minutes—Many clumps in which motion has ceased. One hour—A few clumps still show motion of peripheral germs. Those free in the field are not many, but continue to move.—A modified reaction.

Case III. Typhoid six years before. Fifteen minutes—Agglutination well begun, with clumps containing 10 to 12 germs in which motion is notably diminished. Motility of scattered germs less active. Thirty minutes—Agglutination extensive ; in many clumps no motion whatever perceptible. Forty-five minutes—Absolute cessation of motion in almost all clumps ; a very few show movements of peripheral germs. On close observation, slight motion detected in isolated bacilli. One hour—All clumps large and stationary. A little feeble motion still present in the free germs.—A modified reaction.

Case IV. Typhoid fever five years before. Ten minutes—Agglutination considerable. Fifteen minutes—Clumps larger and more numerous. In many motion is very slight ; in some entirely suspended. Agglutination is marked ; isolated germs less active. Thirty minutes—comparatively few germs which have not joined clumps ; many masses quite stationary ; peripheral motion in others. Forty-five minutes—No motion whatever in any clump. Isolated germs very few in number and moving but feebly.—A modified reaction.

Of class D, Cases I and II, in which there was a history of typhoid, respectively ten and twelve years before, show essentially no difference from those of Class C, in which typhoid fever never preceded the tubercular disease. But with Cases III and IV (Class D), in which typhoid occurred, in the one six years, and in the other five years previous to the tubercular affection, the reaction was of a more rapid progress and of a much more pronounced character ; since in Case III the process was well nigh complete within forty-five minutes ; while in Case IV the reaction was sooner to begin and had terminated typically by this time. On the other hand, with the purely tubercular cases, before a thorough reaction was obtained, a full hour had elapsed.

Case X, of Class C, proved of exceptional interest as it indicated the practicability of employing the Widal reaction as a means of differential diagnosis between typhoid fever and acute tuberculosis in obscure cases.

The patient was a young woman, eighteen years of age, employed in

a private family as the attendant of a lady who had for some years suffered from pulmonary tuberculosis. About the 20th of September, '97, this girl began to complain of general malaise and headache. At the time of the first visit, she had a slight diarrhoea and there seemed to be some tenderness of the abdomen, particularly in the right iliac fossa. The temperature was 100° F., pulse 96 and respiration 24. During the subsequent week the fever continued irregular, varying from 100° to 102° F., and toward the end of the week a few rose colored spots appeared upon the abdomen. Examination of the chest now proved negative except for a little prolonged expiration at the right apex. No diagnosis was made, but the leaning was toward typhoid fever. On October 1st I obtained a specimen of the blood, rather expecting that it would furnish the true Widal reaction. This it failed to do. Instead, the reaction observed resembled so closely those which I had seen with the blood of tubercular patients that I felt justified in reporting the case to be, in my judgment, not typhoid, but one of tuberculosis.

From this time, symptoms of irregular fever, malaise and occasional headache persisted and the pulse continued at about 96. A slight, hacking cough developed, and on October 16th, examination of the chest revealed rough respiration to third interspace on right side, anterior ; and to spine of scapula, posterior. A trial injection of 1.50 milligram of T. B. E. was now given with the result that marked fever reaction supervened, the temperature exceeded by two and a half degrees the maximum of the day before, slight local reaction also took place and the cough was increased ; but there was no expectoration. On October 30th there was another reaction to 1.50 milligram of T. B. E. and this was followed by the expectoration of a small amount of muco-purulent material in which tubercle bacilli were found.

From the results of the experiments above recorded, the following conclusions may be drawn.

1st. Inasmuch as with the blood of tubercular patients who had never had typhoid fever a modified reaction was obtained ; and, as no reaction occurred with the blood of individuals free from tubercular affection and with no previous history of typhoid ; it may not be unreasonable to presume that such change takes place in the blood of the former, not occurring in that of the latter, which in a manner exerts a certain degree of a protective influence against infection with the Eberth bacillus.

2nd. A true Widal reaction is not to be obtained with the blood of tubercular patients ; but what may be termed a modified reaction does occur quite uniformly, the difference being one of time and degree only.

3rd. The modified reaction seen with the blood of persons suffering

from tuberculosis in no way detracts from the value of the Widal reaction as applied in typhoid fever. However, the results shown should, in the use of this diagnostic means for typhoid, lead those to be cautious who are not familiar with what constitutes a true Widal reaction.

4th. It has been demonstrated that a modified reaction takes place with the blood of tubercular subjects ; and the differences between this reaction and that obtained in typhoid fever have been pointed out. Again, it has been shown how very differently the blood of those affected with tuberculosis behaves (when brought in contact with the germ containing fluid of a young Eberth culture), as compared with that of the healthy individual. Certainly each has its own characteristics which are not difficult to distinguish, if one observes at all carefully. In the case of the young woman which has been described, the diagnosis of probable tuberculosis, made by means of the Widal reaction, was subsequently confirmed by the physical signs of eruption of tubercle in the lung ; and by the finding of Koch's bacilli in the sputum. This case in itself affords, I think, evidence that the Widal reaction can and may be used for diagnostic purposes in tuberculosis. At least to obtain such a modified reaction when no history of previous typhoid existed, might lead to a suspicion of tuberculosis, if to nothing more.

But with a past history of typhoid the question would necessarily remain undetermined ; for some influence due to that disease undoubtedly persists to a greater or less degree and for a longer or shorter period of time. That this is true, the four cases of Class D will testify.

Whether or not the Widal reaction may eventually be successfully employed by the clinician in the diagnosis of tuberculosis remains to be shown by investigation of a larger number of cases ; the results in my limited number were sufficiently uniform to indicate that this may be the case and that, in cases never having had typhoid fever, the Widal reaction as a means of diagnosing tuberculosis, may eventually succeed the tuberculin test.

Since the completion of the foregoing paper I have attempted to ascertain if by using a solution of toxines of the tubercle bacillus instead of the blood of tubercular patients a like reaction might be obtained.

One part of a five per cent. watery solution of tubercle proteins free from all perservatives was diluted with ten parts of the fluid, containing the Eberth germs, of just such a culture as those used for the work in '97.

No reaction whatever resulted, from which I concluded that the modified reaction which occurs with the blood of tubercular patients is not due to the presence therein of the toxines of the tubercle bacillus.

IMMUNITY AS AGAINST HEREDITY IN TUBERCULOSIS.

BY LAWRENCE F. FLICK, M. D., PHILADELPHIA, PA.

The theory about tuberculosis which has held sway of the human mind for the longest period of time has been that of heredity. From the days of Hippocrates down, this theory has been the refuge of the vast majority of the human race who accept their ideas about things from others rather than upon their own thought or reasoning. In the medical profession it has always been the theory of the rank and file, and especially of those men who are guided entirely by the traditions of the profession. In this regard it stands in strong contrast to the theory of contagion which all through the history of medicine is linked in the views of the greatest leaders and thinkers. The only break from the popular adhesion to the theory of heredity of which we have historical record, is in the eighteenth century, and possibly as early as the seventeenth century, when the Spaniards and the Neapolitans broke loose from it and accepted the theory of contagion. It may be also that the Jewish people, at least during the early part of their existence, held to the contagious theory. Among all the rest of mankind, as far as we know from history, the theory of heredity held sway with the people and with the greater part of the medical profession.

When one takes a cursory view of the phenomena by which tuberculosis manifests itself among a people, one can readily understand why the hereditary theory held sway of the public mind for so many centuries. By its nature, tuberculosis is markedly a family disease. One by one different members of a family succumb to it, frequently at the same period of life ; and occasionally the disease manifests itself in several successive generations in exactly the same way. The most natural conclusion to be drawn from such a series of events was that a disease acting in this way must be hereditary. Then, too, families in which a series of deaths occurred during a generation naturally became associated in the public mind with the disease and such a family very soon got the reputation of being a consumptive family.

Long association of ideas without further inquiry into deeper causes finally established the theory so firmly in the human mind that it became a creed and was handed down from father to son without question, even guarded by a superstitious awe forbidding inquiry. That occasionally a skeptic mind and penetrating intellect broke through this superstitious crust of plausible reasoning and found beneath stronger reasons for rejecting the theory and accepting that of contagion could have but little

effect upon the public mind and it was not possible for the ordinary intellect to explain away phenomena which were so direct in pointing to self-evident conclusions.

The difficulties in the way of understanding the phenomena by which tuberculosis manifests itself lay in the absence of proper knowledge about the incubation period of the disease and about its method of progress from one stage to another. This knowledge could only come with the discovery of the tubercle bacillus and with the information about its life history which has been given us through the laboratory.

When it once became known that the tubercle bacillus has an incubation period of thirty days under the most favorable circumstances, that it may lie dormant in tissues of the human body which have a meagre blood supply, and that from dormancy it may develop into vigorous activity after years, the singular phenomena by which the disease manifests itself in families, sometimes through several generations, becomes quite intelligible without the assumption of heredity.

In this light, too, those phenomena which never could be rationally explained upon the theory of heredity became reconcilable to reason, such as, for example, the skipping of a generation, or the running backward of the disease from the children to the parents and grandparents. It was chiefly the long time which often elapsed between cases in a family that led to erroneous ideas. In small pox, measles and scarlet fever, and such like diseases, in which the time between exposure and development is short, it was an easy matter to trace the relationship between one case and another, and to understand how the second case must depend upon the first. In tuberculosis, however, in which the exposure is usually of a long period for successful inoculation, and in which the time between exposure and development of symptoms may be years, it is not easy to trace relationship and hence the dependence of the second case upon the first was not apt to suggest itself.

Infection through houses and clothing, in which the germs of the disease might retain vitality for a very long period, also were sources of obscurity. Inasmuch as many cases occurred in the same family it was but natural to deduce that it did so because of heredity. Heredity was the first suggestion that came to the mind and for this reason it was generally accepted as the explanation of the phenomena set up by the disease.

Probably the strongest logical basis for the hereditary theory was the phenomenon which occasionally occurs, that of members of the same family dying at exactly the same age, and of the same thing happening generation after generation.

In the light of the germ theory this strong argument loses its force

and this phenomenon can really be made to tell as strongly in favor of contagion. All living organisms require proper soil for development, and develop better in some soils than in others. The tubercle bacillus finds its most congenial soil in a host that is depressed or whose physical condition is in abnormal state from some cause. We know that there are certain times in life when either from natural or artificial causes the human organism is at a lower ebb of vitality than at others.

In childhood we have the depressing periods of teething and of the development of puberty. In young manhood and womanhood we frequently have the depressing influences of overwork, improper nutrition, and psychological conditions peculiar to that age as well as of dissipation. In more mature life we have the disturbing influences of the menopause in women, and of exposure and hardship in men.

These various causes of depression and malnutrition are apt to come on at almost the same period of life in different families according to custom and peculiarities of the family. The resisting power to tuberculosis is therefore at its lowest ebb in each member of the family at pretty much the same period of life and if exposure to the disease takes place at that time a successful inoculation is almost sure to take place. Now in families into which the disease once has been introduced, there is always apt to be a case in some branch of it, and exposure to a greater or lesser degree for all members of the family is liable to occur. If it is not the father or mother or brother or sister, it is an uncle or aunt or cousin or some relative still farther removed and generation after generation brings exposure to the family. Successful inoculation in some members is bound to occur and to the superficial observer conveys the idea of heredity; and yet, with our present knowledge it is easy to forge out of the same chain of events an unanswerable argument in favor of contagion.

Another very strong argument in favor of heredity and a stumbling block to many minds in the way of contagion is the occasional limitation of tuberculosis in certain families to members resembling the one or the other line of ancestry; to the male or the female members of the family; to those following the complexion of the father or mother; or to those having certain striking peculiarities of bodily formation, of feature or of mental development. The eccentricities and peculiarities being evidently hereditary, it is quite easy to assume that a disease which follows in their train must likewise be hereditary.

According to the old ideas about disease this line of reasoning was logical enough and the conclusions were practically unanswerable. In the light of our present knowledge the fallacy of the argument is very evi-

dent. The heredity of complexion, of peculiarities of form, feature, and mental makeup, is in harmony with physiology, because those qualities are intrinsic parts of the parent ; but heredity of disease, which is extrinsic to the parent falls foul of all that we know of the laws of nature. It is but natural that offsprings having the same peculiarities of form, feature and mental make up as the parent, should offer the same soil for disease and should manifest the same weaknesses at about the same time of life ; but it is incomprehensible how a parent could transmit a parasite to its offspring.

The argument in favor of heredity based upon the consecutive order in which tuberculosis sometimes occurs in families, running from grandparents to grandchildren in regular order has been considered a strong one ; but in the new light it becomes as strong an argument for the contagious theory. We now see how the same law which governs scarlet fever, smallpox, measles and such like diseases, applies with equal force to tuberculosis only that all the stages in the progress of the latter disease are usually extended over a much longer period of time.

With our present knowledge of tuberculosis, it is quite amusing to note to what extent the theory of heredity had to rely upon the credulity of mankind for its existence. The fact that the disease frequently did not develop until old age, that it skipped a generation or two or that it began with the grandchild and went back in regular order to the grandparents seemed to offer no serious logical difficulty to the minds of men. How the transmission of the disease could be thus accomplished no one ever attempted to explain. It is true that in those days tuberculosis was looked upon as a disease intrinsic to the organism, that is, a degeneration, but even upon such a supposition it is difficult to understand how the decay could skip one generation and possibly even two and then appear in exactly the same form as it did in the ancestor ; and whilst it is difficult to reconcile such views with reason, it is still more difficult to make them fit to facts.

In those days tuberculosis was more prevalent than it is now and of course a much larger number of families must have been affected by it. Even at the present day very few families escape the visitation of the disease in some branch or other. If we go back three or four generations we will find families so related by marriage that practically no one now living can have escaped contamination somewhere in his ancestry. If tuberculosis were hereditary it would be absolutely necessary according to those views that every human being alive would be tainted in his ancestry and would according to the laws of atavism be liable to

develop tuberculosis, and yet we know that vastly the majority of mankind escape the disease.

Although under the old way of looking at things there were a good many plausible reasons for believing in heredity, it is singular that many well known facts which strongly militated against such belief were not given more weight in determining conclusions. The strongest of these is the fact that races, peoples and families, who have never suffered from tuberculosis, develop it more readily and in a more malignant form, when brought in contact with it, than those who have been long exposed, or who have had it among their ancestry. In other words, new blood is particularly prone to the disease in its worst form ; and in such cases there certainly cannot be heredity, because the disease never existed even in the remote ancestry.

Let us take, for example, the North American Indians, who prior to contact with Europeans were entire strangers to the disease and who, upon contact with consumptives, became infected by the wholesale and died like flies from it ; heredity certainly cannot have played any part in the ravages of the disease amongst them. What is true of the North American Indian is also true of the natives of the interior of Africa. The disease does not and has not existed among them in their native country but when they are brought in contact with it they almost invariably die of it. History records the same experience for the natives of Bermuda and the Sandwich Islands ; and what is true of these people is true of families.

When tuberculosis attacks families who have remained free from it for several generations, it creates greater ravages and runs a more rapid course than when it attacks families who have suffered from it in their ancestry. The truth of this statement is being forcibly illustrated in some of the southern and western states where the disease has been introduced in recent years by the consumptive invalid. These facts bring us to the parting of the ways between error and truth and we find ourselves with our backs turned for good and for all upon the theory of heredity and are facing the theory of immunity.

There is a law underlying all contagious diseases according to which there is a tendency on the part of the organism producing the disease to exhaust the soil upon which it grows. This tendency is greater or less with different diseases but exists with all contagious diseases and can, I think, be looked upon as an essential feature of a contagious disease. The law which is thus exemplified seems to govern all organic life and to be a fundamental law of nature. We see it especially well illustrated in the vegetable kingdom, and the practical farmer profits by his knowl-

edge of it in arranging the succession of his crops, being careful not to plant the same seed in the same soil too often in succession, but to rotate his crops so as to make one crop prepare the soil for another. (1)

Some contagious diseases exhaust the soil upon a single implantation and therefore seldom occur a second time in the same individual. Such are, for example, small pox, scarlet fever, measles, syphilis, and typhoid fever ; in fact all the exanthematous diseases belong to this group. Other diseases which are due to a living organism, and some of which are likewise contagious in even the narrowest sense of that word, do not exhaust the soil so readily, and in them recurrence may take place after short intervals and complete protection is probably never established. Examples of this latter class are diphtheria, bronchitis, follicular tonsilitis and tuberculosis. But in all temporary immunity takes place and permanent immunity is possible.

In tuberculosis permanent immunity is exceedingly difficult to establish. The reason for this is probably to be found in the nature of the disease ; tuberculosis belonging to that class of diseases which may be termed topical in contradistinction to those diseases which are termed constitutional. Although the tubercle bacillus finds its way into the system either through the lymph channels or through the blood vessels, its parasitic life runs its cycle in some restricted portion of the body where it is soon cut off and entombed in such a way, that it cannot have any effect upon the vital fluids until necrosis has taken place and it again finds its way back into the circulation to begin a new cycle of life somewhere else. The operation of the disease is thus usually very limited in area, in the beginning at least, and the exhaustion of soil is trifling because of the limited influence which the disease germ can have upon the entire body. On the other hand the presence of the localized disease in an important organ such as the lungs is very apt to seriously interfere with the normal action of the nutritive system and to contribute to deterioration and depravity of the entire organism and thus by breaking down normal resisting power aids in preparing the soil for further inroads of the tubercle bacillus.

In practical every day life persons suffering from tuberculosis usually have one exacerbation of the disease after another until they finally go under ; and this is so because each attack really prepares the victim for a subsequent attack by leaving him with less power of resistance. From

(1) There is a difference of opinion as to whether the phenomena here referred to are the result of exhaustion of soil or the throwing off into the soil of a new product. The result, however, is the same and for practical purposes we are better understood when we use the expression, "exhaustion of soil."

this clinical picture of tuberculosis one would be apt to conclude that there is no immunity created by the disease at all, but it will not do to draw conclusions from the clinical picture alone. Many other factors which enter into the subject must be studied, such as environment and occupation of persons who fall victims to the disease, the number and the virulence of the tubercle bacilli which find their way into the organism upon the first inoculation, the fertility of the soil and the family and individual predisposition of the subject.

Looking at the subject from the broadest point of view possible and gathering in all the facts now available, one is driven to the conclusion that tuberculosis does establish a comparative immunity. First of all this comes out in the history of the disease as it affects peoples and nations. Wherever history records the entrance of tuberculosis into a new territory or among a new people, we find the disease of the most virulent and malignant type ; until after the exhaustion of the richness of the soil, when it becomes less virulent and affects a smaller number of people. Immunity alone can give a rational explanation of such phenomena. While with the introduction of preventive measures the decrease in the death rate can be easily understood we find that even where no preventive measures have been practiced there has been a gradual reduction in all countries where the disease has existed for a long period of time

Let us take the United States for example. When tuberculosis was first introduced into the territory which now constitutes the United States its ravages were so violent that it attracted the attention of writers in both England and America. Dr. Rush wrote, "Its rapid progress among us has been attributed unjustly to the growing resemblance of our climate to that of Great Britain." (1) Mr. de Witt Clinton, of New York, wrote, "If the climate of New York was formerly thus mild and healthy and a constant amelioration in its temperature is consequent upon our numerous settlements and improvements as has been maintained by distinguished writers, to what shall we ascribe the extraordinary mortality occasioned by consumption at the present day?" (2) About the same time Dr. Lettson wrote from London, "Whilst the phthisis pulmonalis is rapidly increasing in America and on the European continent it is diminishing here." (3)

This was after tuberculosis had obtained a firm foothold in New York

(1) Treatise upon the cause and cure of pulmonary consumption.

(3) Ibid, page 150.

(2) Gregory's Dissertations, page 153.

and the then American colonies. When the colonies were first settled there was no tuberculosis in them until they became the resorts of the health seeking consumptives of England. Gradually they became infected and it was because they presented a virgin soil to the disease that it became so prevalent and malignant. After a century's ravages the disease began to decline without the institution of preventive measures because immunity began to be established for a larger number of families. In New York City, for example, the deaths from consumption were 1 in 4.2 from 1804 to 1820 ; 1 in 5.4 from 1820 to 1835 ; 1 in 6.5 from 1835 to 1850, and 1 in 8.46 from 1848 to 1859. (1) This gradual reduction continued up until the recent introduction of preventive measures, when it assumed much more rapid strides. It has been said that this gradual reduction in the death rate is due to improved hygiene. But is it really? A century ago there were no large cities in America and no poor people. Whilst there were hardships the hardships were not of a kind which leads to degeneration. There was practically no criminal class. The greater part of the population was made up of farmers and village people, and they had still a healthy water supply. It is true that they had no plumbing, but plumbing was not so necessary then. They were a hardy, vigorous people and remained so up until the time when the consumptive health seeker joined them, and then having been free from the disease for some generations and having lost whatever family immunity they may have possessed when their ancestors lived in Europe they fell easy victims to the disease. Long continued exposure, with the survival of those who could best resist the disease, and the going under of those who were most susceptible, again produced a partially immune race after the passing of many generations.

The truth which stands out so strongly in the history of tuberculosis as it affects peoples and nations also is borne testimony to by the clinical history of families in which the disease occurs. According to my own observations, which I have carefully made over a long period of time, the first victims of the disease in a family are usually the most acute sufferers. I have frequently had opportunity of watching the ravages of tuberculosis in families where four and five members of the same family have consecutively come under my observation and invariably there has been a gradually decreasing malignancy from the first case downwards. These phenomena are observed in all contagious diseases. What is the explanation if not an acquisition of a partial immunity by those who succumb to the disease last? It may, of course, be a deterioration

(1) The Climate and Stat. of Consumption, by H. B. Millard, page 18.

or degeneration of the bacillus producing the disease due to exhaustion of soil, but immunity fits in better with our present views about disease. Immunity is also more in consonance with the best of our knowledge about disease and of the laws which govern plant life.

Probably one of the strongest arguments in favor of immunity in tuberculosis is to be found in those few cases of the disease in which either temporary or permanent immunity is established by an outbreak in certain tissues of the body. We have all seen how cases of scrofula and lupus, where the lymphatic glands are involved in the one instance and the skin in the other, will run for years and years and even for a lifetime without involvement of vital organs and without running to a fatal issue. In the same way the old time white swellings, which we now recognize to be tuberculosis, frequently remain stationary for long periods and sometimes end in recovery with subsequent immunity against the disease. Tuberculosis in the cellular tissue, about the anus, commonly known as fistula, also has the reputation of being in a measure a conservator of life in persons suffering from general tuberculosis. In all of these cases there is undoubtedly a partial immunity established by some cause, for whilst the germs of the disease are in the body they fail to secure a foothold in a vital organ and to colonize and propagate as successfully as they usually do when introduced into the soil of the human organism.

From certain cases that I have seen I am led to think that we may even go farther and say that tuberculosis in certain tissues of the body, if recovery takes place, may set up an absolute immunity against future attacks of the disease. I will relate one such case. In a family consisting of seven members one of the children early in life developed caries of the spine with softening and complete collapse, so that he never developed in body and remained in stature and bodily form a helpless child. Although bright and active in mind he was compelled to content himself with the most restricted locomotion unless it could be given to him by others. While in the house he generally sat upon the floor and succeeded fairly well in moving from one part of the house to another with a sliding motion, for which he used his arms as a motive power. Outside of the house he had to depend entirely upon others for locomotion and for this reason most of his life had to be spent indoors and generally in the kitchen in the company of his mother or sister. The family lived in a small house in a blind alley under the worst possible environment except in so far as these could be improved by cleanliness and a good moral life. First, the youngest daughter, then the mother, then the father, then the youngest son, then the oldest daughter, and

then the oldest son all consecutively contracted tuberculosis, and during the course of about ten years passed away. During those ten years there was always some one in that kitchen suffering from tuberculosis, for the kitchen had to serve as a sitting room, dining room, and infirmary as well, and during the greater part of the ten years all the food of that house was prepared by an advanced consumptive. During two or three years the person preparing the food had tuberculosis of the fingers and had almost every organ in the body affected by the disease. The little cripple was housed in that kitchen during all those years and spent the greater part of his time sliding over the floor, but in spite of the intense exposure he remained immune to tuberculosis.

A fair argument in favor of immunity has been worked out in the laboratory. Certain animals are found much less susceptible to tuberculosis than others. In such there is what is called a natural immunity which has probably been acquired through many generations. But even animals which are very susceptible can by the introduction of certain products of the tubercular process into their blood, be made less susceptible. In what manner this artificial immunity is set up we do not understand as yet, but that it can be produced is certain and its production must be in accordance with that fundamental law of nature by which all living organisms show a tendency to exhaust the soil upon which they feed.

It is no doubt by the same process that recovery takes place in the tuberculous subject when that happy result is obtained. A person who falls a victim to tuberculosis seldom dies from the first attack because the first deposit of tubercle is usually a small one. From the very nature of the tubercular process, namely necrosis with emptying out through healthy tissues, reinfection is almost certain to occur until the soil will no longer tolerate new colonies. Where recovery takes place, therefore, it is because the soil has been exhausted and new colonies cannot get a foothold in the system. If this immunity is of sufficient permanency to endure until every tubercle bacillus has been ejected from the body the recovery is permanent, but where the immunity is of short duration and the bacilli remain in the diseased tissues for a long time, as they often do, a recrudescence of the disease is bound to be lighted up again sooner or later, and this is why so few cases of tuberculosis get well. If it were not for immunity, however, every case of tuberculosis would be bound to run a rapid, fatal course, one attack running into another until the fatal termination has been reached.

If immunity is created by tuberculosis, can that immunity be transmitted from parent to offspring? This question opens up a great field for

observation and in the working out of its answer there will be encountered a stifling burden of prejudice. So far as we can see now, either by the aid of philosophy or of accumulated knowledge and observation we must incline to the affirmative. Logically immunity in a disease follows as a corollary upon its contagion. If tuberculosis is contagious it is due to a living organism, and if due to a living organism it must subscribe to the laws governing all living organisms. Our as yet limited knowledge of biology and the history of disease in general and tuberculosis in particular point to this conclusion. There is certainly a fundamental law of nature by which all living organisms gradually become acclimated to the baneful influences of a parasitic foe or, in other words, gradually lose those qualities which make them selective hosts for parasitic life, whether by developing something which resists it or losing something which attracts it. And all along the lines of civilization down through history we find peoples and races gradually acquiring resisting power to certain disease which their ancestors did not possess and which other races and peoples which have not lived under the same environments do not possess. Tuberculosis is a striking example of the acquisition of this power by the white race as compared with the black and red.

What limited observation I have been able to make on individual cases of tuberculosis would lead me to the same conclusion as is indicated by our knowledge of biology and the lessons of history. Whilst as yet I have no statistics to offer on the subject which would be of any value, my case books will, I think, warrant my conclusions. Of the cases in which I have carefully inquired into the family history vastly the majority have had no tuberculosis in their ancestry for at least two generations. In a fair number of cases the parents, one or the other or both, have had tuberculosis, but they contracted it from one of their own children, they themselves not being the first cases in the family. In this connection it may be well to observe that there is a difference between family predisposition to tuberculosis, existing in the parents and children alike and possibly due to the running out of family immunity, and family predisposition existing in the children alone and due to a tuberculous taint existing in the parents and grandparents. The family predisposition in parents and children alike exists very often, but where it does exist it will almost invariably be found that back of the parents the family was free from tuberculosis for some generations. It would look as though in such cases the family immunity had died out. Instances of family predisposition in children in which the tendency can be traced to the existence of the disease in parent, grandparent or great-grandparent prior to procreation in the immediate descendant are exceedingly rare, and I

cannot recall ever having seen a case. Of course this is all negative testimony, and yet it is of some value when taken at its worth and weighed with other testimony.

The proper cases on which to work out the question of parental transmissibility of predisposition or immunity are those in which the parent is tuberculous when the child is procreated. Such cases are, however, unfortunately difficult to get at. So far as my opportunities for observation along this line will permit of conclusions, the preponderance of evidence is very strongly in favor of the transmission of partial immunity. I have repeatedly seen the children of tuberculous father or mother remain healthy and free from tuberculosis in spite of the most intimate exposure to the disease. I have seen but one or two of such cases die of tuberculosis. Of course the answer to this statement is that my observations are incomplete as it would require a lifetime to determine whether or not such children are immune to tuberculosis. But even the temporary resistance under intense exposure must weigh something in summing up evidence.

There is a vast field for observations along this line and, until such observations have been made, the subject must remain open. So far as a conclusion can be foreshadowed by partial evidence it will, however, be that tuberculosis in the parent established immunity instead of predisposition to the disease, and that the much dreaded heredity of tuberculosis of the past has been a myth.

DIAGNOSIS OF TUBERCULOSIS.

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The question of the early diagnosis of tuberculosis possesses a vast deal of importance to both patient and physician, more especially the former, for upon early diagnosis of the disease depends largely the successful issue of modern treatment. I have read with no little degree of interest both articles by Drs. Barbour and Denny, (1) which have prompted me to report an exceedingly obscure case of pulmonary tuberculosis.

Before entering upon the history and examination of the case, I desire to direct especial attention to some symptoms not therein mentioned and others not sufficiently emphasized. My interest in this particular subject is not of recent date, but a gradual growth of several years. It is, I

(1) *Journal of Tuberculosis*, July, 1899.

think, by the combined experience and observations of true seekers after truth, that we reach anything like definite and correct conclusions.

One thing I have observed ; that two men of acknowledged ability in making an examination of the same case will sometimes reach different conclusions. For example, one will observe or hear something that the other fails to detect, or vice versa. It simply shows a lack of training on the one hand, or a serious mistake on the other. Let this be as it may, there is no condition that should receive the careful, painstaking attention in every detail to the matter of physical examination as this particular disease ; for, as before stated, upon the early detection of the disease will largely depend the successful issue of each individual case.

I am prone to believe that if it were possible, as I believe it eventually will be, to detect the disease in its earliest possible stages, it would be quite as manageable as other specific germ diseases, (diphtheria, for example). The greatest difficulty is that the physician is not consulted until radical changes have taken place in the lung tissue proper. This is true not alone in hospital, but also in private practice. The patient is not ill enough, or at least thinks he is not, to call in medical aid. Coughs are frequently attributed to slight colds, or, strange to say, to gastric troubles ; their true character not being recognized nor even thought of. Physicians are not infrequently deceived as to the true nature of the malady, even when in the last stages.

There are two symptoms not brought out in either paper, viz. prolongation of the expiratory act, and altered vocal resonance. In every individual case, by careful comparison, there will be found some deviation from the normal, the change being more marked as the disease progresses, but it is sufficiently clear at first to give us a keynote to the trouble. I believe I have not had a single case of late years when there was not some appreciable change in resonance. This can, I believe, be brought out best by directing the patient to repeat audibly the numbers 21, 22 and 23. Another symptom to which I desire to call attention is the inability on the part of these patients to inspire deeply without inducing cough.

I have not found a single instance where this could be done without producing cough more or less severe. In ordinary, simple, pulmonary affections such as bronchial catarrh, the act of deep inspiration does not excite coughing, a fact which I have rarely seen mentioned in treatises upon this subject. Notwithstanding, I believe it to be a very important symptom and one not to be underestimated.

Another symptom not sufficiently emphasized is the daily rise of temperature usually in the afternoon. It may be very slight, but it is

rarely entirely absent. I never fail to take the temperature where there is the least suspicion of the disease.

The case about to be related came into my service at Christ's Hospital about June 30, '99. Upon inquiry I found that her illness dated back to January of the present year, the history of her case being one of gastric trouble. She had been examined by two reputable physicians and they had pronounced her lungs healthy and normal, and treatment had been wholly directed to the relief of the stomach.

At my first examination she complained of nothing but weakness and distress in the stomach, at times almost unbearable. On palpation there was considerable tenderness over the epigastric region. Barring these symptoms there was nothing more pointing to serious gastric disturbance. From the moment I first saw the patient I was suspicious of pulmonary tuberculosis, and so stated my suspicions to Dr. Berling, senior interne, although there was nothing tangible pointing to such a condition other than her general appearance, which was of great emaciation, she having gradually lost flesh from the inception of her illness. The eyes were large, prominent and glassy and there was incurvature and slight clubbing of the finger nails. She had not been coughing and complained of no disturbance in the chest. Her mother and sister corroborated all her statements as to absence of cough and chest symptoms. Two examinations were made with negative results. After the first examination, I directed the nurse to make a careful record of temperature.

This revealed an afternoon rise varying from 100° to $101\frac{1}{2}^{\circ}$ and assured me that my suspicions were not without foundation.

At my third examination I was particularly careful to examine every available part of the chest. Upon deep inspiration, which excited considerable coughing (the first she remarked during her entire illness), I discovered a number of fine rales, together with tubular breathing and exaggerated resonance (bronchophony). This was at a point about one inch below the left clavicle at the border of the sternum. At a corresponding point posteriorly, there was dullness on percussion. The amount of surface involved (a circumscribed area of tubercular infiltration) was easily covered by the end of the stethoscope. The balance of the lung tissue seemed perfectly normal, giving little evidence of participation in the trouble.

Now what are some of the conclusions to be drawn:

1st. The importance of a rigid examination, not one but several, if necessary, before pronouncing judgment. Taking the case cited for example.

2nd. That no one symptom should be taken as a guide, but all should

be scrutinized carefully and given their proper places and bearing. Nothing short of this will insure success. It does seem to me that especial stress should be placed on diurnal post meridian temperature, prolonged expiration, vocal resonance, and cough upon deep inspiration.

In conclusion I want to say that the tuberculin test was given in this case with only slight reaction, and that the expectoration was examined by Dr. Whitacre (microscopist to hospital), with negative results.

61 Auburndale Place.

THE TUBERCULOSIS CRUSADE AND ITS PROBLEMS.

BY CHARLES DENISON, A. M., M. D., DENVER, COLO.

An association of influential men, with the Prince of Wales at its head, has recently been organized in England for the purpose of the "Limitation and Eradication of Tuberculosis"; and now Chicago, ever emulative of the most progressive spirit in human affairs, has established a like organization well officered by distinguished physicians. The American Medical Association has also appointed a committee to report upon this subject and to formulate a plan of procedure.

From other centers the indications are plain that a crusade against consumption is being inaugurated. Witness the magnificent act of King Oscar of Sweden, who has assigned his public gift to the founding of sanatoria for the cure of tuberculosis; and the late International Tuberculosis Congress at Berlin showed the deep interest felt in this subject by physicians and sanitarians all over the world.

Either the knowledge of the curability of a once supposedly fatal malady, or the recognition of a very prevalent degeneration which finds its frequent expression in the disease, is arousing thinking minds to united effort to bring this evil under control. It is well; for the task is too great and the disease tuberculosis, incorporates itself too completely as a part of our civilization to be eradicated, or even controlled, except by unusual and united effort. If the needed interest in this matter shall possess the professional students who will do the work, and also bring out the capital and influence to perpetuate it on regular lines, then there is almost no limit to the good this crusade can do.

What a field for individual or collective charity for those financially most able (and from the standpoint of degeneration, perhaps themselves most needing reform) could they be so imbued with the importance of this subject that they would offer commensurate rewards for the most successful solving of the problems which immediately con-

front us ! What an argument the present necessity furnishes for governmental aid, supervision and direction of such a crusade, through a National Board of Health formed and maintained for this and similar purposes !

I do not propose now to go into the elaboration of the many proofs that tuberculosis is the most destructive of all diseases which afflict the human race, and that, therefore, its control is one of the most important subjects which can engage human thought.

It is only necessary here to refer to claims such as that of Bloß of Heidelberg, that gland scrofula precedes pulmonary tuberculosis so universally that he scouts at the idea of inhaling infected air or drinking infected milk, as the cause. His conclusions are based upon the statements of Kelsch, who claims to have found "latent" tuberculosis in two-thirds of young persons, and of Volland, who examined 2500 children and found that 96 per cent., between seven and nine years of age, had indolent, enlarged multiple cervical glands.

The kindergarten sanitarians and would-be municipal reformers of today, who would compass this problem by superficial rules governing disposal of expectoration, should evidently study this question of SELF-INFECTION VERSUS CONTAGION !

My present purpose is to formulate a feasible schedule of subjects to be studied i. e., an outline of this educational problem. How the work will be accomplished is another and important question. The reconnoitering to determine the lay of the land and the strength of the enemy, has to be done, however, and that is the object of this present paper.

It is apparent that there is need of an universal conviction of the importance of this crusade. It is an educational matter and this conviction will surely follow the proper enlightenment of the people.

Not expecting to do more now than to outline this work, I will classify the necessary investigations under the three following heads, and then subdivide into possible specific subjects under which it is best to carry them forward :

- | | |
|-------------------------|---|
| 1st. Etiology or Cause. | a. Historical and Statistical.
b. Degenerative.
c. Bacterial. |
| 2nd. Prevention. | a. Hygienic.
b. Reformatory.
c. Legislative. |

3rd. Treatment.

- a. Hygienic.
- b. Climatic.
- c. Reconstructive.
- d. Specific or Germicidal.

First, ETIOLOGY. The essential to success is to get nearer to the source of tuberculosis than has yet been done. If, as I believe, the cause lies back of the tubercle bacillus, the truth should come out through the following classification thoroughly sifted and elucidated :

1. The Statistics of Tuberculosis.
2. The Circumstantial and Statistical proofs that Mortality records imperfectly represent Tuberculosis.
3. The Tuberculosis which accompanies or unfavorably influences other diseases.
4. The explanation of the Advent and Increase of Tuberculosis in new countries, among primitive races and domiciled animals.
5. The Degenerative versus the Bacterial Cause of Tuberculosis. Or Self-Infection versus Contagion.
6. Tuberculosis always a LATENT (Dyscrasia ?) disease before it becomes ACTIVE.
7. The infection of Tuberculosis and its possibly limited sphere of action, both as to animals and as to human beings.
8. The Proofs of the Transmission of Tuberculosis from animals to man, and vice versa.
9. Immunity and Resistance to Tuberculosis bacteriologically considered.
10. The Blood Changes essential for Tubercular Infection.

These subjects, though not all that could be suggested, should serve to show us how far our knowledge is definite as to the Etiology of tuberculosis. If the mind of the physician, scientist, philanthropist or legislator is too much imbued with the prevalent idea that the tubercle bacillus is the cause rather than it is the concomitant of an already begun degeneration, then that erroneous idea must be corrected before we can properly compass the PREVENTION of the disease.

Second: Prevention. This second division has many and varied phases. I select the following as a preferred list :

11. Climatic Prevention of Consumption.
12. The Ventilation of Schools, Churches, Factories and Homes with Reference to Health.
13. Physical Development as a part of School Education.

14. The Choice of Systems of Physical Culture and their Incorporation into the Curricula of Schools and Colleges.

15. The Teaching of Pneumatics with Reference to Healthy Respiration.

16. The Relation of Occupations to Tuberculosis.

17. The Relations of Foods and Diets to Tuberculosis.

18. The Simplest ways to Detect Tuberculous Milk or Meat.

19. Improved means and facility of Diagnosis of Tuberculosis or lung disease, needed as a basis of PREVENTION.

20. The Limitation of Inherited Tendency to Tuberculosis.

21. Marriage Selection and Age with reference to Immunity of Offspring to Tuberculosis.

22. What Legislation is possible to effectively check the Ravages of Consumption.

23. The Legal Restrictions possible to Child-bearing by Tubercular (Scrofular), Syphilitic, Cancerous or similarly Tainted Parents.

24. The Advisability of a Government Premium either to Physically Perfect Parents per Offspring born, or Penalty to Degenerative Parents for the same.

25. Tuberculosis viewed as a Verdict of the Darwinian Law—"The Survival of the Fittest."

26. (As a side issue). The Possible Future Preventive Measure of Desexualization for Certain Diseases and Degenerate Crimes.

27. (Also a side issue). The Evil Habits of Youth in Relation to Degeneration and to Tuberculosis in the same and following Generations.

28. Sanitaria (1) for the Consumptive Poor. (2) For the "Well to do" People.

29. BUREAUS OF CONTROL for the Isolation of Incurables in Selected Sanitaria or Homes, and for the Procurement of Out-door-life and Occupation for the same.

The great importance of PREVENTION in this crusade is but partially shown in the numerical preponderance of the subjects named in reference thereto, for there are others.

If what we are fighting as consumption is, as I believe, but the result or outward manifestation of a dyscrasia or inherited taint which is preventible by radical and far reaching measures of relief, then this particular etiological course is the true one to take. It is the only way to have a successful reform—namely : a radical and thorough prevention. Not till we thus strike at the root of the matter will we conquer in any crusade against tuberculosis.

Third : Treatment. This third and last division of our subject falls

into a second place in importance compared with the second, suggesting the axiom, "An ounce of PREVENTION is worth a pound of CURE."

Under a, b and c, Hygienic, Climatic, and Reconstructive management, we have :

30. Sanitaria versus Sanatoria ; or Out-door and Country life, as on ranches, versus Institutional treatment.

31. Systematized Gymnasia, on lines of Progression in Exercise, as aids to cure.

32. Home Physical Training and Inhaling Methods as Adjuncts to Treatment of Pulmonary and Throat Tuberculosis.

33. The Preferable Climates for the Different Stages and Varieties of Consumption.

34. Altitude as an ESSENTIAL to the Preferable Combination of Climatic Attributes.

35. The Preferable Make up of an Ideal Climate for the Majority of Pulmonary Consumptives.

36. The Relation of Exercise, Rest, Sleep, Recreation, Mental Diversion, Suitable Work and Change of Scenery to Physical Reconstruction and Resistance to the Disease.

37. The Importance of Good Digestion and the Relation of Foods to the Elimination of Tubercular Infection.

Then come the questions of local and general treatment and the important subjects:

38. Natural and Artificial Immunity to Tuberculosis. with Reference to Specific Measures of Treatment.

39. Relative Immunity to Tuberculosis and how it may be individually increased by Specific Measures.

40. The Analysis of the Curative or Immunizing Effects of various Antitubercular Agencies (Serums INDIRECT) in comparison with those of the DIRECT Varieties of Tuberculin.

41. Germicides and their Relation to Local and Specific Treatment.

42. Bureaus of Control or Invalid Aid-Societies for Providing Suitable Climatic Changes, Out-door life and Homes at Desirable Altitudes for the Consumptive Poor.

43. The Need of a Well-Supported Government Bureau or National Board of Health to Promote, Supervise and Assist these Investigations, and provide means for the poor to live in a good climate.

This last of our subjects should perhaps have been included in the class on Prevention ; but it has to do with the whole crusade and seems to demand here more than the mere mention accorded to the others.

The question of treatment may be left to the medical profession, but every lay investigator or individual, needs the backing and sys-

tematized instruction of a National Bureau of Health, devoting the lives and best energies of selected bacteriologists, physiologists, statisticians and hygienists to this important work.

Not only this, but could the financial bearing of this tuberculosis scourge during a single century—yes, even during a single decade—be appreciated by the powers in control of the government, by the holders of the millions of dollars invested in life through insurance companies, and by the enlightened professions and societies who ought to have a care for the health and well-being of their members and those dependent on them, then there would be such a financial support of this movement against tuberculosis that the results would soon be apparent in an increased longevity of the inhabitants of this land.

How small a portion of the human race are embraced among the insured in life companies? Yet life insurance companies, in the United States alone, have paid out over two hundred million dollars because of deaths from this preventable disease. I ought then to add one more important subject.

44. The Financial Backing of the Tuberculosis Crusade as to the Life Insurance business.

The success of this tuberculosis crusade before these death losses occurred, to which tuberculosis has contributed, would have meant at least a 10 per cent. increase in the longevity of the implicated policy holders, or probably two years or more increase in the average longevity of all the insured. This means not only a two-years longer use, by the companies, of the money invested in reserves, but two additional annual premiums all round—a total enormous saving which would be ample, even in ten years, to liberally pay for the elucidation of all these subjects. But when we consider the guarding against the insurance of tubercular infected lives by the life companies through skilled medical service, and the small proportion of adult persons whose lives are insured then, with a low estimate of even \$1,000, the value actuaries usually put upon an adult human life, the feasibility of the general government's taking hold of this matter and its responsibility for incurring the expense of this crusade is apparent. It is reasonable to believe that a small proportion of the saving of life, on any fair pecuniary equivalent basis, would bear the expense of solving these important problems up to a thorough and satisfactory conclusion not reached heretofore.

Nothing is claimed to be settled in this cursory presentation of these subjects except the great scope and need of this education.

There is no **worthier** opportunity for charitably disposed capital to

immortalize its present possessors than in bequests to a well organized and systematically pushed educational tuberculosis crusade.

Let us hope that thus and through provident national enactment, success may come to this movement against this most subtle and destructive pestilence.

As ever the medical profession will be found in the foreranks of the army of PREVENTION.

The writer will feel amply repaid for his long study of this question if this imperfect presentation of the problems to be settled, will aid in the elucidation of the important question of degeneration or liability to this disease ; or, as stated by Dr. Arthur R. Reynolds—Chicago's Commissioner of Health—"Whether it is wiser to devote our energies to the development and continuance of perfect health, and perfect physical condition and to a better physical inheritance, or to devote our energies to the study of the life habits of the bacillus and its destruction."

To my own mind, the standstill, defensive policy of warding off infection (caused by this wayfaring, yet ever present, bacillus, which after all may only be known to our feeble comprehension in its own adult existence), rather than seeking to eradicate the degeneracy (i. e., the predisposition) which precedes it, has a very slim defense in this common-sense era.

The total eradication of degeneracy is, of course, impossible ; but we can strive for such a reform of our present social state—having in mind an ideal—i. e. the highest type of morality and physical development—that in the great majority of mankind a "suitable soil" will be beyond the reach of this tuberculosis germ.

ORIGINAL TRANSLATIONS. (1)

PULMONARY CONSUMPTION AND TUBERCULOSIS.

BY PROF. CH. BAEUMLER, FREIBURG, GERMANY.

Is it not an anachronism to thus associate these two designations of disease at the present day ? Has not the discovery of the cause of the disease by Koch settled the controversies over the questions whether the anatomic-pathological substratum of pulmonary consumption is an entity, or whether to the pure, inflammatory alteration of the lung, a something special, the miliary tubercle, is to be joined ?

(1) Original translation for the Journal of Tuberculosis from the Deutsche Med. Wochenschrift, May 25, 1899.

Is it not unanimously recognized today that the tubercle bacillus causes not only the miliary tubercle, but also the peculiar inflammatory alterations in the lung which play so important a role in pulmonary tuberculosis ?

In general the latter sentence will pass current, but nevertheless the two designations cannot be termed equivalent ; because while one has a purely symptomatic and clinical significance, the other is pathological and etiological. While today both terms are freely used in the same sense, the actual significance of the term "pulmonary consumption" is left out of consideration ; something which happens often enough with the the true meaning of words in general.

In every language there is an endless number of designations of which the original sense has long passed out of the popular memory, at least in certain localities ; while another term which perhaps represented originally but a part of the first, has come to take its place, and the physician who nowadays speaks of pulmonary consumption thinks less of the disease as accompanied by wasting of the tissues, than of the pathological alterations associated with tuberculosis which have their origin and progress through the action of Koch's bacillus.

It would perhaps not matter so much if the term "pulmonary consumption" were used in a wholly general sense for a lung affection caused by the tubercle bacillus without taking account of the very variable clinical manifestations under which the tuberculous affection appears, but in the case of the affections under consideration it is not so indifferent which designation is used, as it is in many other subjects of purely professional interest about which the lay mind does not concern itself.

In the present case we are dealing with a disease concerning which the laity, and not alone the sick but also the healthy, are in the highest degree interested. Since the popular designation "consumption" is more intelligible to them, representing as it does, not only a clinical picture but also the clinical course, and indeed a grave one, should we not earnestly consider the abandonment of this term which is of no value to the profession ?

For the physician the term "pulmonary tuberculosis" is sufficient, by it he understands certain changes in the lung, caused by tubercle bacilli, which among other phenomena, may assume the clinical picture of consumption or phthisis, i. e. a wasting away of the tissues due chiefly to fever, but which may often be attended by only insignificant phenomena, causing the patient himself few or no burdensome symptoms.

Besides there has been for some time a more frequent use of the designation "pulmonary tuberculosis" even on the part of the laity, and now

when the masses of people are made more and more aware of the ravages which the disease constantly produces, and of the measures which should be taken for actual relief, it must appear highly important to bring about a designation for the disease which should not imply that the disease is necessarily "consumption" in the ordinary sense of the word, but that by the radical measures demanded, recovery can be secured before the wasting stage has been reached.

The standpoint today is, therefore, essentially different from that which Felix von Niemeyer (1) characterized in his time by the words, "The greatest danger for most consumptives is that they become tuberculous," i. e., that to the inflammatory changes in the lungs an outbreak of miliary tubercle should be added, due to the absorption of a then unknown agent from the disintegrating caseous centres.

Today we can exactly transpose Niemeyer's sentence, and say, "The greatest danger that can befall an individual with pulmonary tuberculosis, is that he become a consumptive," i. e. that he may suffer such progress of his tuberculous lesions that he develops the phenomena of pulmonary consumption, which have by no one been more sharply defined and more accurately described in the centuries past than by Richard Morton (2) in the following words:

"Phthisis pulmonaris est consumptio partium universalis a morbo affectu seu infarctione, tumore, inflammatione, et exulceratione pulmonum primum orta, indeque tussi, dyspnoea, aliisque ejusmodi symptomatis thoracis ab ipso initio stipata, et cum febre primum lenta et hectica, dein inflammatoria et tandem putrida intermittente conjuncta."

The tubercle has therefore lost something of the evil prognosis, attached to it in Niemeyer's time, because it was then looked upon as a neoplasm, and was placed beside other malignant new formations.

We now know that even in the case of miliary tubercle we have to deal with a sort of inflammatory process which may terminate in several ways ; among others in fibrous metamorphosis and cure.

Under what circumstances, may we now ask, does a sufferer from pulmonary tuberculosis become consumptive ?

In contrast to the times when it was believed that the disease under consideration was a local expression of an essentially congenital general dyscrasia of the fluids of the body, we now know that pulmonary tuber-

(1) *Klinische Vortraege ueber die Lungengeschwindsucht*, 2 Aufl. Berlin, 1867, S. 20.

(2) *Phthisiologia seu exercitationes de phthisi*, etc. Aut. Richardo Morton, *Francof. et Lips.* 1691, pag. 3.

culosis is primarily a purely inflammatory affection, caused by the tubercle bacillus and by its slow growth and that by developing more or less slowly according to the constitutional and other conditions of the patient, such a focus or several of them may form and exist for a time without producing any symptoms whatever.

By confluence of a number of miliary tubercles into a larger nodule, the latter may become caseous and even undergo purulent disintegration, with formation of a small cavity, without the patient experiencing any material evidence of illness.

The patient may become somewhat paler, his appetite may diminish and there may be slight digestive disturbances ; there is slight fever which is usually overlooked, and he may lose weight in consequence ; but of actual lung symptoms, there is at most only a slight cough without expectoration, or possibly with a very little in the morning after clearing the throat. Tubercle bacilli, even in pure culture, may be found in such expectoration, but if there is no breaking down of tissue they will be absent.

When such circumscribed local deposits are not too small, they may be recognized by auscultation and percussion as R. Oestrich has recently and rightly emphasized. (1) On some occasions, perhaps following great bodily effort, haemoptisis may suddenly take place, either disappearing quickly, or persisting unabated for some days. A few days later, accompanied by high fever, the disease can assume a more serious aspect, and soon terminate in death with appearance of a rapidly developing multiple lobular pneumonia or perhaps of a lobar infiltration.

If the inflammatory process has not been too extensive a slow recovery may, however, result, but demonstrable cicatricial contraction usually remains ; after the fever ceases the patient's general condition becomes quite satisfactory, the cough and expectoration gradually diminish, and cease entirely ; tubercle bacilli often persist for a long time in the scanty morning expectoration.

If the affected lung area was slight in extent, such individuals may consider themselves in perfect health and in respect to their recovered strength and subjective sensations, they may really be, and with proper care remain so.

The clinical picture just given is that of "galloping consumption," but in the language of pathological anatomy, it is not acute miliary tubercu-

(1) Zeitschr. f. Klin. Med. Bd. XXXV, S. 491.

losis ; on the contrary it is a tuberculous lobular or lobar pneumonia (1) caused, probably, by aspiration into the bronchioles of the contents of cavities with tubercle bacilli and other bacteria capable of exciting inflammation.

By many observers, as for instance, Norbert Ortner, (2) the co-operation of other bacteria is held to be responsible for this clinical type, while A. Fraenkel and Troje (3) attribute the rapid diffusion of the inflammatory process (described by Buhl under the term desquamative pneumonia) to the chemical action of the toxins generated by the tubercle bacilli.

An entirely different clinical aspect is presented by acute, miliary tuberculosis of the lungs, which is not to be confounded with the miliary lobular pneumonia just mentioned, and in which miliary tubercles are also abundantly present in the lobular, inflammatory foci.

In acute miliary tuberculosis proper, the tubercles which are thickly diffused throughout the lung tissue constitute the chief pathological alteration. This form likewise pursues a rapid course amid severe and usually fatally ending phenomena; at times almost without fever, or with subnormal temperature in the presence of cyanosis and other signs of grave, circulatory disturbance and marked dyspnoea.

We omit here the consideration of general, miliary tuberculosis ; the so called tuberculous sepsis, its course and symptoms being entirely different and having little or nothing in common with chronic phthisis.

Cases of "galloping consumption" described above are, however, of relatively infrequent occurrence. The usual and most frequently occurring form of pulmonary tuberculosis has an entirely chronic course. With increasing cough and purulent expectoration, consolidation develops especially in one upper lobe and new foci of disease appear from time to time in different regions of the lungs.

For weeks and months the symptoms of this affection can be insignificant although the local changes in the apex of the affected lung and tubercle bacilli in the sputum, are easily demonstrated.

With the advent of a higher degree of fever and of more rapid emaciation, the picture of "consumption" appears in the foreground; even now the progress of the disease is not necessarily continuous and uniform : on the contrary, the further course may still be marked by improvement and aggravations. In particular do we meet cases which deteriorate

(1) Deutsche Med. Wochenschr. 1893, No. 1.

(2) Die Lungentuberculose als Mischinfection. Wien and Leipsiz, 1893.

(3) A. Fraenkel and G. Troje. Ueber die pneumonische Form der acuten Lungentuberculose. Berlin, 1893.

rapidly under unfavorable external conditions, but contrary to our expectations they lose their fever quickly while the cough and expectoration diminish and they regain weight, when subjected to the more favorable influence of hospital care or a sojourn in a climatic resort under proper care and management, although the objective symptoms present but little change.

Improvement of this character would be continuous and would lead oftener to complete recovery if such patients were not so frequently compelled to return to their former conditions, or did not choose to do so when no necessity exists, thus new exacerbations of the disease appear until finally—in many cases only after years—the truly downward course is reached from which no retrieve is possible.

The manifold clinical features which make up pulmonary tuberculosis and which is intimately blended with the symptoms of pulmonary consumption may, however, be simulated by affections of the lungs which either have no connection whatever with tuberculosis, or in which tuberculosis plays an entirely subordinate role for a long time, forming often only the last link or terminal stage of a lung disease which has continued for years under an oscillating course.

In differentiating such cases we must particularly bear in mind the chronic processes caused by inhalation of dust, and in which the course of the chronic bronchitis is at times interrupted by acute bronchopneumonia.

The resulting symptoms of consolidation, fever, emaciation, cough, with purulent or bloody-purulent sputum, awaken the suspicion that we have in fact a case of tubercular disease, but after repeated and careful examinations the tubercle bacillus is never found in the sputum.

Time and again such patients lose their fever and recover rapidly from severe symptoms and much more so than tuberculous subjects. When they finally die from cardiac insufficiency, the autopsy shows in the lungs in some parts chronic fibrous induration, perhaps with bronchiectatic cavities, and in others a high degree of emphysema, but no tubercle. Possibly as a matter of chance without any connection with the fatal termination, old caseous or calcareous changes may be found in the bronchial glands. In such cases phenomena of bronchiectatic cavities with acute or chronic putrid bronchitis may temporarily or permanently be present.

As we have frequently observed, putrid bronchitis or pulmonary gangrene may be simulated by retention of and subsequent putrefactive changes in a large blood or fibrin clot in a bronchiectatic cavity or in a labyrinth of such, from which a hemorrhage has occurred. A patient

in our clinic perished from a secondary hemorrhage under such circumstances before the old, putrifying clot had become small enough to be expectorated.

Cases of chronic, interstitial pneumonia of an upper lobe with bronchiectatic cavities are at times attended by severe hemorrhage, and other symptoms, such as emaciation, pallor and cyanosis, suggesting at first thought the presence of pulmonary tuberculosis. Tubercle bacilli are however, never found in the sputum and fever is absent.

If, in these cases of non-tuberculous pulmonary disease, tubercular processes are superadded at a later period, the manifold character of the clinical picture, which in either case is complex enough, becomes still more equivocal, and the recognition of the true state of affairs becomes yet more difficult.

Pleuritic exudates may give occasion to think of pulmonary tuberculosis, especially on account of the general symptoms which accompany them ; the suspicion being the more justified because tuberculosis is such an important factor in the genesis of pleural inflammation ; but many such exudates heal without being immediately followed by pulmonary tuberculosis, while during the course of the disease positive data for the existence of tubercle are absent.

Most important for diagnosis in such cases would be the demonstration of tubercle bacilli in the sputum, for rales at the apices may occur in a lung compressed by the exudate, when tuberculosis is absent.

To an entirely different group of diseases belong cases which may simulate recent or insiduously progressing pulmonary consumption ; especially is this true with masked or so called walking cases of typhoid fever.

These cases are more frequently seen by hospital physicians when after several weeks of illness, during which several physicians may have been consulted, the patient is finally obliged to take to his bed and enters a hospital.

If the first few days of careful observation and examination show enlargement of the spleen, more or less marked meteorism and roseola, and if the stage of large morning remissions of the fever has been reached and miliaria crystallina are present, the diagnosis of ilio-typhus is more readily made.

But the cyanosis, the sibilant ronchi in the upper, and the moist rales in the posterior portion of the lower lobes permit a suspicion which cannot be quite suppressed, that the case may be one of miliary or other form of tuberculosis of the lung, the presence of the diazo-reaction of the urine speaking for one conclusion as well as for the other.

But what if important symptoms such as roseola, splenic enlargement

or the characteristic fever curve, are not typically developed? Then even a longer period of observation may not be able to remove the uncertainty of diagnosis and only the rapid and favorable termination of the illness, or the autopsy will throw light upon such obscure cases, which I have most frequently met in children.

In still other infectious diseases, in which as a result of a prolonged fever and heart weakness, bronchial catarrh and hypostatic congestion are present, the clinical evidence may suggest pulmonary tuberculosis in the acute or chronic form, the more so when the fever is remittent.

Here belong septic affections and notably syphilis, in which latter the bone and skin lesions of the later stage (but at times also the early eruption periods) may be attended with remittent or an intermittent type of fever, but which may be made to disappear in a few days by the use of antisyphilitic treatment. (1)

If such a patient has a cough because of incidentally present bronchial catarrh or emphysema, an extraordinary likeness to pulmonary tuberculosis is produced, even when evidence of consolidation cannot be demonstrated.

The cutaneous and osseous lesions and the somewhat enlarged spleen can lead to the right diagnosis while the result of anti-syphilitic treatment would clinch it.

Whether the co-existence of consolidation in the lung may represent actual pulmonary syphilis cannot be decided with absolute certainty by the results of anti-syphilitic treatment, although the rapid disappearance of fever and of the pulmonary symptoms and the absence of tubercle bacilli in the sputum speak in favor of it.

To the realm of septic, infectious diseases belong cases of chronic polymorphous erythema (2) with repeated exacerbations. In this disease, remittent fever, an enlarged spleen and enlarged lymph glands are frequently present while more or less pronounced lung symptoms may accompany its course.

In many, but by no means in all instances, tuberculosis is actually associated, especially in the lymph glands.

These cases offer a peculiar symptomatology and the diagnosis may be difficult or in doubt for a long time, the habitus of most such patients (which belong as a rule to the period of childhood or puberty), the remittent fever and the progressive wasting giving rise from the start to suspicions of tuberculosis.

(1) Ziemssen's H'dbuch d. spez. Pathol. u. Therapie, 1886. Bd. III, S. 360.

(2) Verhandlungen der Naturforscher Versammlung. Heidelberg, 1889, S. 400.

Outbreaks of acute erythema, resembling at times erythema nodosum, occur the same as we observe them occasionally in undoubtedly tubercular individuals, especially when the disease involves the serous membranes.

Uffelman has called attention to the subject of erythema nodosum in children who perish later of tuberculosis, but he attributes a too unfavorable significance to this phenomenon, and recovery may follow in either case.

While either of the foregoing affections may be combined with actual tubercular disease, there is still an entirely different series which, on account of chest symptoms, pallor and emaciation, give the patients a consumptive appearance.

To this series belong cases of tumors (sarcoma, carcinoma, lymphoma) which may originate in the pleural sac of a lung or in the mediastinum ; also cases of actino-mycosis and of echinococcus of the lung, all of which may give rise to violent hemorrhage. Repeated examination of the sputum may reveal bits of tumor, actinomyces grains, echinococcus sacs, or portions of the same, but never tubercle bacilli ; and prolonged observation enables us to eventually make the correct diagnosis in the majority of cases, in arriving at which the absence of fever, or at least of high fever, the absence of the diazo-reaction and of all other symptoms which would naturally be present in tuberculosis are highly important for differentiation.

The simple expectoration of blood is frequently deemed sufficient to pronounce a person to be tubercular or a consumptive, and in most cases such a diagnosis is correct enough although other positive signs may be absent; but to one kind of bloody expectoration in which such a diagnosis is erroneous, I will here call attention; namely, the usually slight hemorrhage occurring with mitral stenosis.

I have frequently met with such cases which because of a wrong diagnosis have been treated with creosote simply because the patient had a cough and at times expectorated blood, or the foamy mucous expectoration had a bloody tinge. If, as frequently happens in such cases, the anterior border of the left lung shows fine, bubbling rales, or perhaps here and there, but especially in the apices, we hear sibilant ronchi, these observations may naturally and pardonably support the diagnosis of tuberculosis, but the error should be readily recognized when the examination of the heart shows obstruction of the mitral orifice.

If not incidentally present from other causes, such cases pursue their course without fever, the sputum does not contain tubercle bacilli, and the dyspnoea, the cyanosis, and cough are easily explained by the passive

venous congestion, produced by the heart affection, which reveals itself with certainty by the presystolic murmur at the apex, and by the doubling up of the second sound.

The capillary hemorrhages are simply the expression of congestion in the lesser circulation and digitalis removes this kind of hemorrhage as a rule quite promptly.

Patients with aortic aneurism are often looked upon as sufferers from pulmonary consumption. The cachexia, which develops in the latter stages, the hoarseness occasionally produced by pressure paralysis of the recurrents, the cough, with occasional bloody expectoration, when the aneurism is adherent to the trachea or to one of the larger bronchi ; the symptoms of pulmonary consolidation and catarrh from compression of lung tissue, may in some cases attract more attention than the symptoms proper of aneurism.

In these cases it is the absence of fever and of tubercle bacilli which must cause us to doubt the presence of a tuberculosis, both affections may, however, co-exist in the same patient.

Of all other affections of the heart and aorta, ulcerative endocarditis is much more likely than any other to be confounded with tuberculous pulmonary consumption, because of the accompanying remittent fever and the co-existing bronchial symptoms. Here we actually find the important symptoms of consumption, such as fever, night-sweats, emaciation, as well as chest complaints, like dyspnoea, and slight or marked cough accompanied at times by bloody expectoration.

But the evidence of endocarditis at the mitral or aortic valves, or more rarely at the pulmonary valves, the absence of tubercle bacilli in the sputum, the comparatively slight degree of the pulmonary symptoms unless hypostasis or hemorrhagic infarcts are present, will after due observation, lead to the exclusion of tuberculous disease.

In cases of pulmonary infarctions (occurring in the course of chronic heart-disease, or by transportation of venous thrombi), a clinical picture develops which is similar to that of pulmonary consumption, the more so when fever is present for a considerable period, or when a pleuritic exudate appears.

A study of the condition of the circulatory organs, the unusual location of the consolidation with reference to tubercle and the absence of tubercle bacilli in the sputum will, however, in most cases lead to a correct diagnosis.

In the earlier part of this paper it has been emphasized that nowadays it is especially important to recognize cases of pulmonary tuberculosis as early as possible before the stage of pulmonary consumption has set in.

Knowing that the healing of tuberculous pulmonary lesions occurs almost exclusively through substitution of connective tissue for the perishing lung substances—in others words through cicatrization, encapsulation and sclerosis—and not as in ordinary acute inflammations of the lung by liquefaction and absorption of the products of the disease, it must be self-evident, that the smaller the focus of the disease and the less advanced the pathological changes are at the time when the patient comes under treatment, the slighter will be the consequences upon the surrounding tissues, the pulmonary circulation and the organism at large. It is therefore proper at the close of this communication to consider the points which in case of suspicion of tuberculosis should receive especial consideration :

1. In the front rank stands the most exact, frequently repeated examinations of the entire lung by auscultation and percussion.

In this connection variations in the loudness and special character of the respiratory murmur are to be observed by comparison of symmetrical areas.

Weakening of the respiratory murmur over the right apex where the inspiration is usually louder than over the left, may already justify suspicion when not explained by other causes.

Equally suspicious is an audible expiratory murmur over the left apex, while its observation on the right side has less weight, because of its usual presence in health.

To find such suspicious manifestations, frequently repeated examinations are required ; when at times we may also detect moist rales, or an isolated squeaking sound, if the patient is made to cough.

The upper portions of the chest, both front and back, must be subjected to a searching examination, and especially in each of the upper intercostal spaces, three or four places should be carefully percussed and auscultated.

If in the apex but slight abnormal conditions have been found we must more particularly note the external areas of the upper portions of the chest, the first and second intercostal spaces toward the shoulder and axilla, and even in the third intercostal spaces, where we may find pronounced symptoms of consolidation (bronchial breathing, fine crepitant rales, muffled tympanitic resonance), when over the apex proper only doubtful or slight alterations are perceptible.

Another important locality beneath which infiltration with formation of small cavities are not infrequently found is above and behind, between the posterior extremity of the spine of the scapula and the vertebral col-

umn. In this locality we may at times find rales when the patient coughs, although the apex is apparently normal.

In percussion we must always pay particular attention to the exact configuration of the vertebral column in order to avoid errors. The slightest scoliosis, because of its unequal influence over the curvature of the upper ribs, may give occasion to notable variation between the percussion resonance of symmetrical areas.

2. The expectoration must be repeatedly examined with all precautions. It should be placed upon a black plate for more ready selection of parts, to be later examined for bacilli; careful microscopical search should be made for evidences of tumors, for fibrin-coagula, asthma crystals, spirals, actinomycosis grains, echinococcus sacs, etc. The examination for bacilli should if necessary be repeated by using Biedert's method.

3. The temperature should be accurately taken at intervals at different hours of the day while the patient is quiet in bed, and also after fatiguing exercise. (Penzoldt (1) and Birgelen. (2))

4. From time to time, say every eight days, the patient should be accurately weighed.

5. If the results of the above named examinations are negative while the suspicion of pulmonary tuberculosis is nevertheless urgent, a trial injection of Tuberculin should be given.

REVIEW OF CURRENT LITERATURE.

ON THE DIAZO-REACTION AND ITS PROGNOSTIC SIGNIFICANCE IN CONSUMPTION.

In 1882 Ehrlich sought to apply Gries' discovery of the diazo-reaction to the routine examination of urine. It soon became apparent, however, that the reaction occurred not only when glucose, acetone and biliary acids were present in the urine, but also in the course of the infectious diseases, (typhoid fever, tuberculosis, etc.); and therefore its practical value was but lightly thought of and the test was soon abandoned by most clinicians.

At a later period, however, it became evident that, while the reaction was devoid of qualitative significance, it still possessed a certain value from the quantitative standpoint. It was observed that an accentuation

(1) Penzoldt Stintzing: Handbuch der Therapie innerer Krankheiten, Bd. III, S. 300.

(2) Muench. Med. Wochenschr. No. 15, u. 17.

of the reaction generally corresponded to an increase in the severity of the disease ; and hence it became evident that this reaction was destined to serve prognostic rather than diagnostic ends. Once the diagnosis was made, by whatever means, the diazo-reaction was able in the majority of cases to indicate the degree of severity and, *PARI-PASSU*, the probable outcome of the disease. We may here remark that this reaction is entirely independent of the coexistent fever for its manifestation and could occur in an equal degree in afebrile periods of infectious diseases.

As for the rationale of the operation of this test, it is generally given as follows: Certain substances ordinarily eliminated from the blood are retained in various severe general diseases ; the body is no longer able to cast them out, and if they are thus retained it is only a question of a short time before they cause death by coma.

It is to Michaelis, Prof. v. Leyden's assistant, that we are largely indebted for the revival of the application of diazo-reaction to medical diagnosis or rather prognosis. He has published two articles during the present year which deal especially with the application of this reaction to the prognosis of phthisis (*Deutsch. med. Wochenschr.* 1899, No. 10; *Zeitschrift f. diät. und physikal. Therapie*, 1899, Bd. III, No. 2).

Before proceeding further it will be well to give the particulars of the diazo-reaction in its application to human urine. Two reagents are prepared, designated respectively by the letters A and B. Reagent A consists of a solution of muriatic acid, 25 parts to 500 parts of water, to which is added 2.5 parts of sulpho-anilic acid (a drug which is listed by Merck under that name). Reagent B consists simply of .5 parts of sodium nitrite dissolved in 100 parts of water. The manipulation of these reagents is as follows :

Take 49 c. cm. of Reagent A and 1 c. cm. of Reagent B and shake them well together. Then take 10 c. cm. of this combination (freshly prepared) and add to it an equal amount of the urine to be tested ; and further add to this mixture from 1-10 to 1-8 of its bulk of ammonia water (10 per cent. aqua ammonia U. S. P.). If the reaction takes place it is manifested by a rose-red or dark red coloration of the foam produced by shaking the mixture. The desired hue is most aptly likened to the coloration produced in the foam of "weiss-beer" by the addition of raspberry juice (it is quite probable that this same hue could be obtained by substituting "root-beer" for "weiss-beer"). Any other coloration of the foam, a yellowish or brownish, for example, must be totally disregarded in this connection. Some of the confusion incidental to the application of the diazo-reaction is to be traced to these irregular colors. If too little ammonia is used the reaction fails to occur ; and if on the other hand too

much ammonia is used the resulting color is immediately decolorized. The ammonia should be added *EN MASSE* ; for if it be added drop by drop with agitation of the mixture, the desired coloration is likewise decolorized as fast as it is formed, because of the presence of the unneutralized acids. Other sources of error occur ; for example, those due to the substitution of other alkalies for ammonia. If the investigator entertains any doubts as to the success of the reaction he should allow the mixture to stand for at least 24 hours, if the diazo-reaction has taken place a dark green precipitate is then apparent.

Returning now to the subject matter of Michaelis' articles, viz : the prognosis of phthisis by the diazo-reaction, the author makes the general statement that whenever an intense reaction is obtained, whether in the first, second, or third stage, the prognosis is so grave that we may foretell the death of the patient within the ensuing six months. This reaction is independent of febrile movement and appears to stand in no definite relationship with the number of tubercle bacilli found in the sputum. It also happens that we may find evidences of cavities without a diazo-reaction, although the latter may occur in a high degree in cases which show only beginning lung-alterations. Brieger, representing Prof. Koch, states that cases exhibiting an intense diazo-reaction are held to be too far advanced to merit a course of tuberculin treatment.

Michaelis' own material in which this reaction was studied amounts to 106 cases, with 75 positive and 31 negative results. Of the "negative" cases but two died, while two more cases showed no improvement. All the other cases were improved and two were cured—total of improved cases, 87 per cent. Of the "positive" cases not one recovered, eight were improved, while of the remainder 59 were known to have died—in general 89 per cent. went from bad to worse with positive reaction in contrast to the 87 per cent. which improved with negative reaction.

Michaelis states that these figures require no commentary ; and he holds that the physician, as a general rule, is justified in excluding from sanitarium treatment any patients whose urine exhibits the diazo-reaction. At the same time it has been observed in rare instances that the reaction may disappear from the urine under careful nursing and abundant nourishment. These few apparent exceptions, however, are not sufficiently numerous to alter the original dictum that a phthisical patient with an intense diazo-reaction offers the worst sort of a prognosis and should by no means be received into sanatoria intended for the cure of tuberculosis.

TUBERCULOSIS AND THE CURRENT MEETING OF THE BRITISH MEDICAL ASSOCIATION.

At the annual meeting of the British Medical Association for 1899, a number of papers bearing upon tuberculosis were read.

Dr. Douglas Powell in his address entitled *Recent Advances in Practical Medicine*, spoke at length on the prevention and cure of tuberculosis. He called attention to the gradual reduction in the mortality rate, and was inclined to attribute this result more to general sanitation than to bacteriology ; stating that the pioneers in sanitary movements against the disease knew nothing of the bacillus, and that there is too much commercialism involved in the more recent attempts to exterminate the disease through attacking the bacillus. This new prophylaxis by hastening matters rudely also provokes political reactionism directed against legislation which is regarded as tyrannical.

With regard to the claims now made that consumption is never hereditary, Dr. Powell appears to think it a mere technicality. Consumptive parents still beget children of whom the half become consumptive. Sir Wm. Jenner was right when he stated a generation ago that the transmission was one of the best attested facts in medicine.

Attention was called to the much greater frequency of tuberculosis in male infants ; the mortality in females above the age of 20 has been steadily declining of late years, despite the indoor life, lactation and other predisposing influences to which women are exposed.

It is well to avoid breathing dust and to disinfect sputum and to do anything of this nature which harmonizes with ordinary cleanliness, but we should avoid alarming the public unduly.

We are in danger of forgetting the known dependence of tuberculosis upon wet subsoil, a claim which is a matter of authentic record. It is by no means certain that the tuberculosis germ may not, like the bacilli of tetanus, and anthrax (infinitely less pathogenic), be an inhabitant of certain soils. (! !)

Dr. George Wilson, president of the section on State medicine, indulged in a bitter and vehement tirade against the entire fabric of bacteriology, laboratory diseases, immunity and serotherapy, claiming that it is a false application of Jenner's discovery of vaccinal immunity and no less absurd than homeopathy. He endorsed vaccination to the full, but denied the existence of any similarity between it and the work of Pasteur and Koch. He condemned vivisection for its after effects upon animals, which were doomed to a lingering death unrelieved by anodynes. Of tuberculosis he states that it cannot be disproved that the bacillus, being always associated with necrosis, may not play a conservative role

by rendering the dead tissue harmless. The bacillus, in any case, cannot be gotten rid of by bottling it up in spittoons and destroying it. The alleged deadly bacillus found in cows' milk is most likely from cows' dung. Bacteriology is steeped with commercial interests. The German sanatorium movement is but a branch of the life insurance business, founded less on broad philanthropy than on personal selfishness and thrift. One nation captures another's butter trade by representations based on bacteriology.

Dr Wilson claims that he has expert authority to sustain him in all of his radical claims. He appears to believe that his most telling blows are the facts that no germ has ever been found for smallpox and believes none ever will be found ; and that the only immunity to a disease comes from having had the disease ; and that even this immunity is only relative. The benefit from bacteriology has been purely indirect by being in line with cleanliness. Even aseptic surgery comes in for a share of his ridicule. Dr Wilson admits that the bacteriologists are honest in their convictions, and states that he is also disinterested in his views. His creed is a simple one—namely : Isolation in contagious diseases and cleanliness in filth diseases.

(Dr. Wilson's article would not be deemed worthy of mention in this JOURNAL, were it not for the fact of the somewhat exalted position of which he is the incumbent. Assuming that he is sincere in his beliefs, we cannot refrain from expressing our own opinion that he is a mere imitator of the late Lawson Tait and a would-be inheritor of the forensic mantle of the latter gentleman, who although a genius in operative surgery, is said by many to have been possessed with the foibles, conceit, intolerance and inconsistencies which so often accompany genius. Dr. Wilson appears to possess the shortcomings wrongly or rightly attributed to Dr. Tait without any degree of greatness which might entitle him to the right to antagonize almost the entire medical profession. If not a mere copyist, Wilson is a representative of that almost brutish ultra-conservative element so common in England. He reminds us of the old fellow who opposed the introduction of gas grates because "he wished a fire which he could stir with a poker and spit in." Neither the aberrations of genius nor the sodden stupidity of ultra-conservatism are to be consulted in problems which require so much scientific acumen and practical common sense as those involved in the future study of bacteriology and its cognate subjects.

With regard to the merits of the case, Wilson's inconsistency is pitifully apparent in his warm advocacy of vaccination in the same breath in which he condemns nearly all the remainder of medical progress. He joins the ranks of the haters of scientific medicine and uses their arguments throughout ; yet this body of fanatics attack vaccination with the same arguments which they, in common with Wilson, apply to vivisection, serotherapy, etc. : "It does no good, but much harm," "it is commercial," etc., etc.

As for Wilson's qualifications in the studies which he seeks to condemn, any one with a fair knowledge of biology, chemistry and other exact sciences will readily detect the sciolist in the author of the paper presented by the president of the Sanitary Section of the British Medical Association. The article reminds one of a tirade of an illiterate negro preacher against the results of the life-work of Darwin or Spencer. (Ed.)

A NEW METHOD OF CULTIVATING THE TUBERCLE BACILLUS.

Hesse (*Zeitschrift fuer Hygiene und Infectiouskrankheiten*, Bd. XXXI, No. 3), gives the impediments to previous attempts at culture of Koch's bacillus, as follows : Slow growth of Koch's bacillus, overgrowth of other kinds of bacteria, uncertainty of results of inoculation of animals. Hesse proposes a method of cultivation which will largely do away with these drawbacks. A culture medium must be devised upon which the tubercle bacillus will grow more readily than any other germ. As a result of much experimentation Hesse concludes that Koch's bacillus may be invariably cultivated from phthisical sputum, and discredits the belief that the germ is often present in a lifeless or non-virulent state. His conclusions, promulgated by himself, are that all sputum which contains the bacillus at all, contains it in a living state, and capable of reproduction ; that it is possible to produce cultures in a short time (hours instead of days) ; and that his new method of cultivation is able to largely replace the test of animal inoculation.

Hesse's culture medium is very complex and consists of Heyden's nutrient medium 5 gm., salt 5 gm., glycerin 30 gm., agar-agar 10 gm., normal soda solution 5 c. cm. and distilled water 1000 c. c

Heyden's culture medium is a soluble albumen, the properties of which lie between those of coagulated albumen and somatose.

The normal soda-solution has a strength of 28.6 per cent. crystalized soda.

The technique of Hesse's method is as follows: Twenty c. cm. of culture medium are placed in a Petri double saucer (9.5 cm. diameter) and allowed to set. The saucer is then inverted and kept in this position. Sputum is collected from the patient in a sterile glass vessel. A bit of sputum the size of a lentil is taken up on a platinum loop, and the culture-medium is sown with 20 or 30 bits of the mucopurulent substance. The saucer is then placed in the incubator.

After an indefinite period cover glass specimens are made as follows: The cover-glass is caught by forceps and sterilized by passing it through the flame of a Bunsen burner. It is then applied from below to the culture medium opposite one of the flocculi of sputum and made to adhere by the aid of the platinum loop; it is then removed with its adherent sputum by the aid of the forceps.

By this method Hesse has got beginning growth of the tubercle-bacillus as early as 5 or 6 hours after the specimens were placed in the incubator.

Evidences of growth are, increase in the length or breadth of single bacilli, presence of double bacilli and small colonies. Comparison of the culture with the crude sputum will quickly reveal any change in the appearance of the bacilli.

Hesse never failed to get a culture when the sputum contained bacilli.

DEMONSTRATION OF TUBERCLE BACILLI IN THE FAECES.

Rosenblatt (Ctbl. f. innere Medicin, 1899, No. 29), states that in pronounced intestinal tuberculosis the faeces are usually watery. The bacilli which develop in the superficies and interior of tuberculous ulcers become mingled with the diarrhoeal stools and it is therefore difficult or impossible to find them.

In such cases Rosenblatt has found the following method of advantage. He gives enough laudanum to produce hard, sausage-shaped faeces, and then investigates exclusively the surface of the latter, seeking for adherent mucopurulent collections. If such are found, there will be no trouble whatever in demonstrating the presence of the bacilli in the first slide examined. The rationale of this procedure is as follows: The hard, scybalous masses in their forward movement pass and take some of the bacilli, enveloped in muco-pus, along with them. These bacilli suspended in a thin stool would readily escape detection.

Rosenblatt hopes that the profession will make use of his method and report results.

TRANSMISSION OF THE BACILLUS TUBERCULOSIS THROUGH THE PLACENTA.

Auche and Chambrelent (*Arch. de med. Exper.*, July, 1899), state that authentic cases of transmission from mother to foetus are extremely rare. Of the two methods usually employed, microscopic examination is inconclusive unless the bacillus is found—histological changes are not to be accepted as absolute proof. The method of inoculation has no value unless done under strict asepsis. In every case one method should be used as control for the other.

Clinically we must be satisfied that the mother is really tuberculous. If this fact is assured we must next examine the tissues of the foetus for bacilli. In stillborn infants and those who live but a few moments after birth, we may instantly exclude the possibility of extra-uterine infection. Tuberculous lesions of the placenta itself or bacilli in the blood of the cord furnish the most convincing proofs of transmission.

In analyzing the recorded material the authors reject all cases occurring before the time of Koch. The first case reproduced is that of Landouzy and Martin (1883). A woman in the last stages of phthisis bore a child which lived six hours. A portion of the child's lung removed under strictest asepsis was introduced into the peritoneal cavity of a guinea pig which thereupon developed a typical case of tuberculosis. In a second case reported, at the same time, a bit of placental tissue inoculated into a guinea pig, in the usual manner, was followed by tuberculosis. In a third case (Armanni, 1890), parts of foetal viscera caused tuberculosis in the experiment animal. In 1891, Schmorl and Birch-Hirschfeld reported a case in which Koch's bacilli were found in the foetal liver. In all, the authors have collected notes of 12 cases of this character. Generally speaking, the mothers in all of these cases were highly tuberculous, while the children were generally healthy to the naked eye and were shown to be tuberculous only by the guinea-pig test. In a few exceptions bacilli were found in the foetal organs.

In another series of nine cases histological tubercle was found in various foetal tissues. In this section the authors relate a personal case very fully. Tubercles were numerous in the liver, spleen and lungs of a child who was born of a tuberculous mother and lived 26 days. In this case the placenta was studded with tubercles, which, moreover, contained Koch's bacilli. The blood of the umbilical cord likewise contained bacilli. In the child the liver and spleen bore the brunt of the tuberculous process while the lungs contained but few tubercles.

Granted that tuberculosis may be exceptionally transmitted to the

foetus through the placenta, how are we to explain the infrequency of this occurrence ?

The answer to this question is readily forthcoming. Koch's bacillus seldom occurs in the blood of the tuberculous patient. When it is found therein we have that peculiar condition known as tuberculous septicaemia.

The authors conclude their study by stating that there are at present about a score of cases of this mode of transmission properly authenticated ; that this accident is most likely to occur in a rapidly developing and generalizing maternal tuberculosis ; that it never occurs before the end of the fifth month of pregnancy ; that the placenta is always involved when the foetus is infected. Further, bacilli may be present in the foetal tissues without lesions of any character, and the rule is for the bacilli and the lesions to be diffused throughout the foetal tissues, although exceptionally we may find alterations in single organs only (adrenals).

TUBERCULOSIS AND ITS PREVENTION.

Sims Woodhead (Edinburgh Med. Journal, May, 1899) delivered a popular lecture on the subject of tuberculosis at the Yorkshire College, Leeds, last March. Human tuberculosis, he said, was practically a necrosis of lung-substance, bits of which were expectorated, with formation of cavities. In the necrotic, expectorated tissue, tubercle bacilli were found. Various other tissues of the body could each be the seat of the disease, showing its infectious nature.

Tuberculosis also attacks cattle, and all captive or domestic animals are exposed to the ravages of the same infectious disease. The cow, like man, usually suffers in the lung tissue ; but in the case of the horse and pig the alimentary tract usually bears the brunt of the infection.

A peculiar and important local manifestation of tuberculosis is afforded in the affection of the udder of the cow, usually seated in one quadrant of the organ which often presents an almost stony hardness. The udder never presents any sign of pain or tenderness under these circumstances.

The essential character of all tuberculosis is to begin at a single small focus and to become generalized throughout the tissues. Woodhead states that the bacillus of Koch is now universally accepted as the direct cause of tuberculosis. Milk from a tuberculous udder will be found to contain minute bits of necrotic tissue containing bacilli. Pigs fed on such milk soon develop enlarged glands beneath the jaw. They cannot

be fattened and when killed exhibit tuberculous tonsils and lymph-ganglia—the latter extending from beneath the jaw to the pleura—while the spleen and other organs at times participate. Experiments showing this infection of the pig may be repeated almost at will.

The tubercle bacilli are known to be alive, because they can be sown and made to multiply. The resulting cultures communicate the same disease to the pig as did the infected milk.

The bacilli may be destroyed by boiling heat and by certain antiseptics. It is strange that milk is about the only article of animal food which is used without being cooked.

The author considers tuberculosis hereditary, but only to a slight extent. It is apparently inherited by calves to the extent of one-fifth of one per cent., but even this small percentage may contain sources of fallacy. Healthy cattle may be bred from tuberculous stock by placing the new born calves upon a diet of sterile milk and taking other necessary precautions. The line of reasoning which underlies the breeding of cattle, keeping the offspring away from sources of infection, may be equally applied to mankind.

With regard to the transmission of tuberculosis by meat, it probably occurs infrequently. When meat is well-cooked the danger of contracting the disease is minimal. In the case of tuberculous cows with healthy udders, Woodhead is inclined to believe that bacilli do not occur in the milk. It is, however, impossible to pronounce udders free from incipient tuberculosis during life.

Concerning the diagnostic uses of tuberculin, certain dairy men employ the test unsolicited. We now know that a number of details must be employed to make the test trustworthy.

With regard to the life of the bacillus outside of the body, Woodhead believes that it may maintain itself in wall paper, or even in the soil ; but he admits that proofs are lacking.

ON THE STATE OF THE HEART IN THE TUBERCULOSUS SUBJECT.

Regnault has published a work entitled "*Le Coeur chez les Tuberculeux*" (Paris, Bailliere, 1899), in which he sets forth the following conclusions :

After much study on the living subject and cadaver he is able to endorse the procedure of Prof. Potain in determining the boundaries of the heart by concentric percussion as a practical and exact diagnostic resource for estimating the precise degree of hypertrophy or atrophy of the organ.

Atrophy of the heart is not the rule in chronic tuberculosis ; but the latter disease is nevertheless essentially atrophic in its tendencies through limiting haematosiis, lessening oxidation, depressing the circulation, etc.

True or apparent cardiac hypertrophy occurs in the great majority of cases of fibrous phthisis on account of complications which affect the myocardium either directly or indirectly.

Dilatation of the right heart, while frequent in the living, is not often found in autopsies. Especially marked in the right auricle, it occurs less frequently and less markedly in ulcerous than in the fibrous forms of phthisis. It results from emphysema, pulmonary sclerosis and pleural adhesions, but still more from the limitations of the circulatory field by the caseous process. It may lead up to tricuspid insufficiency and asystole.

Lowering of arterial pressure is a constant phenomenon in the tuberculous, and becomes more evident as the fever becomes more intense and the cachexia more advanced. In the slow apyretic or subfebrile forms of phthisis, however, it is equally in evidence, beginning at the debut of the malady and occurring independently of any plan of treatment. This phenomenon is due entirely to the toxin of the bacillus tuberculosis. Lowered arterial pressure is a diagnostic sign of some worth in the absence of pulmonary symptoms. As a rule we may say that the tuberculous subject who recovers is the one whose arterial tension is again raised.

Instability of the pulse, likewise a constant phenomenon of tuberculosis, is due to the lowering of arterial pressure and paresis of the vessels. This lowering of pressure is frequently accompanied by an acceleration of the pulse which is out of proportion to the temperature. Attacks of tachycardia occur in the tuberculous from mechanical irritation of the ganglia, or toxic neuritis of the pneumogastric. Tachycardial attacks in connection with lowered arterial pressure form a syndrome which points to latent tuberculosis.

Atrophy of the heart may antedate all the pulmonary phenomena, but should not be regarded as a necessary stigma of predisposition, but when it exists it doubtless increases the receptivity of the organism to the disease.

Potain's manner of examining the heart, already referred to, is the so-called "concentric method." Regnault assumes that this latter is "too well known to require description." This statement, however, would not be true in the case of American physicians. The method is described in detail in *La Clinique Medicale de la Charite* (by Potain and others),

Paris, 1894, p. 22. It is an inversion of the ordinary method of examining the heart by percussion. Instead of first striking over the heart and then percussing centrifugally until we get lung-resonance, Potain says that it is much more trustworthy to begin percussion outside of the cardiac area and work inwards until we get cardiac dullness. Hence "centripetal" would be a better term than "concentric" for denoting the method.

PULMONARY OSTEO-ARTHROPATHY AND CLUBBED FINGERS.

Fowler and Goodlee in their recently published work upon Diseases of the Lungs (London, 1898), gives a section each to these two affections, with accompanying radiograms. As is well known, tuberculosis is one of the diseases in which these conditions occur, but they may also complicate bronchiectasis and empyema.

Pulmonary osteoarthropathy requires differentiation from acromegaly, with which condition it has been confounded. The fingers and toes are both clubbed but, according to some writers, the clubbing is unlike that which is observed in the "Hippocratic fingers." The present authors, however, regard the two affections as substantially the same, differing only in degree. In simple clubbing only the soft parts and nails are affected, while in the severe type both bones and joints participate. The process has been known to involve the wrists and ankles and even the elbows, knees and hips. The joints are stiff and motion is impaired, while the extremities are cold and clammy, perspiring profusely. Certain similar changes have also been noticed in the nose (enlargement with reddening at tip) ; also doubtful lesions of the upper jaw and spine.

With regard to pathology, the bones and joints may or may not present alterations ; when the latter occur they consist of a subperiosteal deposit of bone, erosion of articular cartilages, etc. It has been claimed that the process is essentially septic, while others see only a localized tuberculosis. Certain marked resemblance to syphilitic osteo-arthritis has been suggested.

Is this affection a distinct pathological entity ? It is certainly impossible to differentiate it clearly from simple osteo-arthritis, and tubercular and syphilitic bone and joint lesions, at least so in many instances. As before stated, it has even simulated acromegaly.

Coming now to the simple clubbing of the fingers (Hippocratic fingers), a condition as common as the other is rare, the classical description of Trousseau still holds good for the affection as observed at the present

time. This author remarks that the toes are at times involved, and since his day it has been ascertained that even the nose may participate.

Clubbed fingers may be observed in perfect health and the causation and pathology still remain unknown. The authors merely suggest that this affection may be of the same nature as pulmonary osteo-arthritis, although they are by no means sure that the latter affection is a pathological entity, the subject is one of the greatest interest and merits further study.

TUBERCULOUS AFFECTIONS OF THE EAR.

Barnick (*Klinische Vortraege aus dem Gebiete der Otologie und Pharyngo-Rhinologie*, 1899, Bd. III, No. 4), gives an account of the history of our knowledge of this subject, which he concludes by stating that recent authorities agree in the belief that middle-ear tuberculosis is contracted in the vast majority of cases by aspiration of the bacillus through the Eustachian tubes.

His first descriptive section is devoted to tuberculosis of the external ear. Lupus vulgaris of the head and face frequently involves the entire auricle, but in addition to this common type there is a rare and peculiar form of lupus infiltration confined to the lobule which may not implicate the skin at all, and which appears clinically as a circumscribed tumor, the true nature of which can be determined only by microscopical or bacteriological examination. Eiselsberg and Haug have described cases of this sort in patients otherwise perfectly healthy. As cases of this kind have occurred solely in women, and, as the majority of the latter had had their ears pierced, this peculiar type of lupus may perhaps be looked upon as a phase of inoculation-tuberculosis.

Authors have also reported cases of tuberculous perichondritis with abscess formation as having occurred—apparently from violence—in the ears of individuals who were suffering from advanced phthisis. Finally, simple tuberculous ulcers of the ear have been described as occurring under various circumstances, such as by inoculation from the pus of scrofulous glands, and from infected instruments (or other sources of contamination) in connection with piercing the ears. It appears quite safe to say that there is no direct connection between tuberculosis of the auricle and the same affection elsewhere in the ear, with this exception, that the spreading form of lupus of the auricle may occasionally extend along the auditory canal and ultimately involve the tympanum.

With regard to the middle-ear tuberculosis it is easy to understand the

readiness with which bacilli in the naso-pharynx and pharynx could be aspirated into the tympanum by the various acts of sneezing, blowing the nose, etc. Naturally victims of pulmonary and laryngeal tuberculosis are especially exposed to this accident since the infected sputum must often adhere temporarily to the pharyngeal walls.

In some instances of infection of the middle-ear in subjects with healthy air-passages, chiefly children, it has been claimed that the ear has been secondarily implicated in consequence of latent tuberculosis of the tonsil. In other cases the primary deposit is apparently found in the cervical or mesenteric ganglia. The path of infection in these cases must, of course, be either the lymph or blood vessels.

Rare forms of infection of the middle ear are afforded by the extension of a pharyngeal lupus along the eustachian tubes.

From the standpoint of pathological anatomy, tuberculosis of the middle ear, illustrates the common tendency of tuberculosis to produce a great number and variety of lesions; and upon bearing in mind the complex structure of the normal ear it will readily appear that the ravages wrought by a disease like tuberculosis almost defy description.

An acute type of the disease may be distinguished, which, however, occurs very infrequently. This condition usually accompanies a high degree of cachexia in connection with pronounced pulmonary phthisis. The symptoms consist of a partial loss of the acuteness of hearing, which may readily be overlooked. The first serious symptom for which the physician is consulted is sudden rupture of the membrane and escape of pus. The process, while acute, is nevertheless not painful. The perforations are usually multiple (two or three) with a very destructive tendency, they may coalesce and thus cause obliteration of the drum-head; at times narrow bridges remain. The local affection tends to improve with time on account of the expulsion of the caseous matter of the tuberculous focus through the perforation, but the inroads of the general disease invariably cause the patient's death.

Chronic middle ear tuberculosis differs from the acute form in being relatively frequent, and in the associated condition of the patient, which is usually good, despite the presence of other tuberculous foci, usually in the lungs. The patients almost invariably connect the ear affection with a violent attack of coughing and an accompanying sensation of air entering the eustachian tube. The sudden loss of hearing, with abscess-formation, and the general absence of pain agree with the syndrome of the acute form. The drum-head is destroyed in the manner already described, but more slowly. The bones of the middle ear are only superfi-

cially attacked, with resulting erosions. There is, however, a destructive type of middle ear tuberculosis, the existence of which is explicable only upon the ground that the process has primarily attacked the cancellous tissue of the bone ; these cases pursue a course similar to the ordinary evolution of bone-tuberculosis. The diagnosis can usually be readily made after perforation. Tubercle bacilli are not always found in the purulent discharge. The mutilation of the drum-head is regarded by Barnick as characteristic. The prognosis is hardly favorable under any circumstances. Arrest of the process may occur in patients who retain their general health, but the focus of disease still remains. As in ordinary otitis, there is danger of cerebral complications when the osseous lesions are deeply placed.

The treatment, aside from general measures, consists of cleanliness and disinfection of the middle ear, which is best done with physiological salt solution, followed by some antiseptic irrigation. Insufflation of iodoform should be practiced. All use of caustic, curette or other active interference is contraindicated. Primary osseous tuberculosis which threatens the brain naturally requires active interference, but under other circumstances the latter is to be feared as a possible agency in the generalization of the disease.

Our knowledge of tuberculosis of the internal ear still abounds in gaps. With the possible exception of extension of basilar meningitis into the internal auditory meatus. Labyrinthine tuberculosis is invariably due to extension of the disease from the middle ear. Thus far it has been impossible to determine the symptoms, if any exist, which inaugurate the extension of a tubercular process from the sound-conducting to the sound-perceiving apparatus. The most usual route of extension is by the fenestra rotunda. If high tuning-fork tones are heard more imperfectly than low ones there is a certain presumption in favor of an invasion of the labyrinth. The hearing, already impaired by middle ear disease, continues to grow worse. Since the labyrinth is practically never involved without pre-existing disease of the middle ear, labyrinth tuberculosis is necessarily a panotitis with such symptoms as that general condition exhibits. More or less facial paralysis and vertigo may be present, often a high degree, and bilateral nystagmus has often been observed. The prognosis is always bad and patients with tuberculous panotitis almost invariably die of complications. Remedial measures comprise nothing beyond the general management of otitis media.

TUBERCULOSIS OF THE OVARY.

Urfey (*Beitraege zur Geburts. u. Gynaekol.* 1899, Bd. II, No. 1), states that originally it was the custom to deny the existence of ovarian tuberculosis, but that of late years a number of undoubted cases have been reported, and that Wolff has been able to find a record in literature of 108 cases of which the diagnosis was made in the majority of instances only by the aid of the microscope.

Urfey adds the following case to the recorded material. Patient aged 25, wife of day-laborer. Family and personal history good. Five years before had an alleged attack of typhlitis with peritonitis. Menses began at age of 16 and were regular and natural for six years. Her marriage (three and a half years before) has remained unfruitful. For the past three months she has had considerable abdominal pain, more to the right side, with pain over the sacrum; these pains are aggravated by walking. General condition otherwise excellent. Vaginal examination shows uterus to the left, in moderate retroversion. To the right of it a tumor is felt, immobile, of the size of an apple, not painful. Diagnosis of right-sided ovarian tumor. Laparotomy revealed a universally adherent tumor the size of a goose egg, which was extirpated with some difficulty. Post-operative course uneventful.

Microscopical investigation showed a general tuberculous process in the ovary, tube and broad ligament. The diagnosis was histological and undoubtedly correct, although tubercle bacilli were not found. A high degree of caseation was present.

The question of etiology is entirely obscure. As far as could be determined the tubo-ovarian lesions were primary, the patient being otherwise free from disease.

AFFECTIONS OF THE PERIPHERAL NERVES IN PULMONARY TUBERCULOSIS.

Rudolf Schmidt (*Wiener Klin. Wochensch.* July 20, 1899), has made a special study of this subject in the clinic of Prof. Neusser. The full title of his paper, translated, reads as follows: The Clinical Pathology of the Peripheral Nervous System in Tuberculosis of the Lungs, with Especial Reference to Acroparaesthesia.

His conclusions are as follows: Disturbances in the peripheral nervous system which have relationship with pulmonary tuberculosis are divisible into affections of the neighboring nerves (brachial plexus, inter-

costal nerves, etc.), which are chiefly of mechanical nature ; and disturbances of a dyscrasic nature, otherwise toxigenic affections.

Of particular examples of the first class may be enumerated unilateral pressure pain in the brachial plexus to which may be conjoined homolateral acroparaesthesia, often in the ulnar territory. These symptoms possess diagnostic interest, since they are coexistent with early tuberculosis, initial haemoptysis, etc.

In acroparaesthesiae occurring in the young we must suspect the near or remote presence of tuberculosis as a possible cause.

The symptomatic acroparaesthesia of tuberculosis differs from other etiological varieties in the following particulars :

- 1 They are much more frequent in male individuals.
2. They are often associated with bronchial catarrh.
3. They are often unilateral.
4. Pains from pressure upon the brachial plexus occur upon the same side.
5. The usual syndrome of early phthisis supervenes sooner or later (evening fever, night-sweats).

VEXED QUESTIONS RELATING TO TUBERCULOSIS.

Dr. E. L. Trudeau, of Saranac Lake, recently delivered a lecture at the Johns Hopkins Hospital, which is published in the Hospital Bulletin for July. He stated that despite the great progress in our knowledge of tuberculosis, many important problems yet remain for solution.

For example, we know but little of virulence. Do the bacilli generate more toxins under certain circumstances or do they elaborate products of different toxicity ? Or is increased virulence due merely to an increased rate of growth in bacilli ? In Trudeau's experience tuberculin is one and the same substance whether made from weak or virulent cultures.

We need increased light on the ports of entry of the bacillus. The author is inclined to look with favor upon the view that adenoids are frequently the seat of the initial lesion.

We know but little of predisposition. Fowls successfully resist human tuberculosis and succumb readily to avian tuberculosis, while the converse is true of guinea pigs. Fowls are proof against bovine tuberculosis while the rabbit succumbs readily to all three forms. By passing these forms of bacilli through serial cultures they appear to acquire sufficient virulence to infect animals ordinarily immune.

Under the head of pathology we need to determine in the future the

chemical changes which the digestive fluids undergo in tuberculosis ; the precise cause of the anaemia of the tuberculous; the exact rationale of the cure of peritoneal tuberculosis by laparotomy. Further we must ascertain whether the tubercle represents a defensive effort on the part of the organism or a mere nidus for the breeding of germs. Why again do bacilli disappear at times before death in cases of acute miliary tuberculosis ? Is it true that a tuberculous individual cannot be reinoculated by the virus of the disease ? What does the presence of bacilli in the milk, urine and semen indicate ? Finally, why do tubercle bacilli "bead" ? Is it a process analogous to spore formation ? Is this germ a true bacillus ?

The smegma-bacillus, bacillus of timothy-grass and a germ found in pseudo-tuberculosis all bear strong points of resemblance to Koch's bacillus.

Our knowledge of tuberculin is in its infancy and the strength of different preparations may vary greatly. Weak cultures may produce a relatively large volume of toxin, which, however, is of low potency. A most urgent need is the isolation of the toxin or toxins contained in the tuberculin. No less than three protoids may be isolated from the bodies of the bacilli. The new method of Nocard is very promising. He encloses micro-organisms in celloidin capsules and inserts them into the peritoneal cavities of animals. Here they flourish and manufacture toxins, while they are not exposed to the defensive action of the cells. The animal is poisoned by the toxins which are diffused through the capsules, while the microbes remain enclosed within the latter. By Nocard's method it appears to be possible to render saprophytes pathogenic.

With regard to diagnosis, we can no longer wait for bacilli to appear in the sputum, but must look to the tuberculin reaction for accuracy. It is now believed that tuberculin is a specific irritant to both the tubercular focus and the susceptible individual. The tuberculous foci are rendered hyperaemic and give up large quantities of toxins, which entering the blood cause the reaction.

Many now believe that tuberculin is a dangerous poison which tends to aggravate the disease. It is indeed true that violent and oft repeated reactions may weaken an organism in an advanced stage of the disease. In incipient cases, however, the conditions are very different, and there is no proof that the injection of tuberculin is prejudicial ; numerous authorities fail to record a single case of injury following a small injection repeated once or twice. In addition to the tuberculin test the author thinks favorably of X-ray diagnosis, through the difference to be observed in the ascent of the diaphragm on the two sides of the chest.

Under the head of treatment the author speaks with approval of modern sanitary measures, but hopes for the discovery of an antitoxin in time, for prevention or cure. At the present time he is working with attenuated cultures of living germs for preventive purposes. After "vaccinating" animals with these attenuated cultures, and then using virulent cultures, he has been able to produce a relative immunity, the vaccinated animals living three times as long as the unvaccinated controls.

TRAUMATISM AND TUBERCULOSIS.

Lannelongue and Archard (*Revue de la Tuberculose*, July, 1899), in an article which was read (by the former) before the Berlin Congress, refer to the celebrated experiments of Schueller on the development of tuberculosis in contusions of joints, from which it appeared that a trauma might localize a generalized infection. The authors believe that clinical experience sustains this experimental law. It is true, however, that a large wound not communicating with the air, such, for example, as a fracture, seldom or never becomes a bacillary focus.

Schueller's experiments were made at a time when bacteriology was in a crude condition, and some of the lesions were undoubtedly infected with septic rather than tuberculous matter. The present authors have repeated the experiment of Schueller as follows: Twenty guinea pigs were inoculated under the skin with tuberculous material, and when the infection was evidently becoming generalized (19 to 24 days after inoculation), the animals were subjected to various injuries, such as contusions and fractures, luxations, etc., affecting respectively the bones and joints. After the animals had died of tuberculosis, no specific lesions were to be seen at the site of the traumatisms.

This negative result was obtained when intraperitoneal inoculations were practiced. The date of injury was also varied so as to be synchronous with the time of inoculation and other variations in experimentation continued to give negative results.

Since Schueller's experiments were made upon rabbits, the authors substituted this animal for the guinea pig. The inoculations of (human) tuberculous material (pure cultures) were practiced in the veins, peritoneal cavity, and trachea; while traumatism was inflicted at a variety of periods, including even several days before inoculation. The results were negative in all but one of thirty-five cases. In this exception the rabbit had been subjected to resection of the hip eight days before the (intravenous) inoculation, and showed a small caseous focus in situ, which

proved to be virulent. As this was an open wound the experiment could not be accepted as an absolute corroboration of Schueller's results.

The authors then abandoned pure cultures and made use of sputum, pus, and bits of lung tissue removed during autopsy. In a certain number of cases septic phenomena followed inoculation, but over and above these there were five positive cases of tuberculous lesions, including suppurative arthritis, fungous arthritis and fungous osteitis. In all these positive cases the inoculation and trauma were practiced synchronously. It seemed that the presence of the septic material was necessary to obtain success.

The authors therefore give Schueller full credit for having demonstrated twenty years ago a genuine law in pathology which applies to tuberculosis as it must also to any other general infectious process. The numerous negative results can be readily explained by the presence or absence of certain elements, the number and virulence of inoculated bacilli, the degree of germicidal power of the circulating blood, etc., etc.

RELATION OF PULMONARY TUBERCULOSIS TO CERTAIN OTHER DISEASES.

Fowler and Goodlee (l. c.) give a brief sketch of the relations existing between phthisis and other diseases, some of which were formerly believed to exclude the coexistence of tubercular affections.

Pleurisy often precedes phthisis, but the connection between these affections is so much involved in obscurity that many theories have been advanced to explain the connection. The authors believe that the pleurisy is a primary manifestation of tuberculosis. This view is hard to prove because these pleurisies usually get well. An occasional autopsy appears to confirm the authors.

Bronchitis, once thought to be the natural forerunner of pulmonary consumption, is now admitted to be nothing more than a contributing factor to some extent in furnishing a soil for the bacillus. If phthisis begins with bronchitis the later is probably of tuberculous nature. Considering the frequency of bronchial catarrh, but a small proportion pass into phthisis.

Pneumonia seldom results in phthisis, and when it does so terminate it was doubtless tuberculous from the start (caseous pneumonia).

Valvular heart disease, once thought to be incompatible with phthisis, is now known to occur not infrequently with the latter affection, especially when there is congenital pulmonary stenosis. At the Brompton Hospital for Consumptives there were at one time four out-patients in at-

tendance who had mitral disease associated with pulmonary tuberculosis.

Diabetics, to the number of 50 per cent., die of true tuberculous affections. The phthisis of diabetics was formerly erroneously believed to be a special affection. Phthisis in diabetes may terminate in arrest.

Cancer is seldom found associated with active phthisis, but in autopsies upon the cancerous it is extremely common to find signs of arrested pulmonary tuberculosis. It is very common to find a family history of tuberculosis in cancerous subjects, and those who escape the family scourge of tuberculosis appear to be predisposed to death from cancer.

GENERAL SUBACUTE TUBERCULOSIS OF INFANTS.

Eustace Smith, in the latest edition of his work, "On the Wasting Diseases of Infants and Children," (Phila., 1899, P. Blackiston's Son & Co.), describes the above condition as one which causes a considerable mortality of nurslings.

The type described by Smith is a general tuberculosis which is especially seated in the lungs, liver, spleen, lymph ganglia and pia mater. The points of original infection may be a minute intestinal ulcer or a cheesy Peyer's patch, but such primary lesions are at times impossible to find.

The infectious germ may travel by way of the lacteals to the thoracic duct or may enter the blood; if the number of invading microbes is large, numerous secondary foci will appear, but if only a few of the germs are absorbed no more than a single secondary lesion may result.

Smith states that the diagnosis of this type of disease is not necessarily difficult, and may even be easy in typical cases. The children have often a peculiar physical make-up. They are slender, cut their teeth very early and the nervous system may also be precociously developed. These children eat well, but nevertheless get thin rapidly. There is a pitting of the skin stated by Smith to be characteristic of this disease. Another valuable sign is a dry, dingy and absolutely inelastic skin. This state of the skin, when not connected with diarrhoea, and when associated with the pitting just described, is very significant. Symptoms referable to particular organs are rare in nurslings. The temperature may be normal and if elevated is a symptom of value, but wasting diseases usually produce a subnormal temperature. In cases of fever it is well to examine the ears, as tuberculous otitis not infrequently develops.

As has been said there is a remarkable freedom from local symptoms; but, of course, these children may take cold or get indigestion or diarrhoea from simple causes. The disease is essentially a progressive maras-

mus, the child wastes and grows weaker until it dies. At times a tubercular meningitis or a broncho-pneumonia constitutes the terminal lesion.

In making a diagnosis of these cases it must be remembered that the digestion may be normal and the tongue clean, appetite good and passages normal ; a picture very different from the wasting due to intestinal troubles. A confusing element is naturally present in the fact that children are so liable to attacks which would, if present, obscure the picture of tuberculous atrophy—such as teething, colds and local affections in general. Wasting due to inherent syphilis may at times closely resemble the tuberculous marasmus ; but the syphilitic baby is naturally restless and fretful, in striking opposition to the unnatural quiet shown in such tuberculous subjects. There are also a number of minor points which serve for differentiation of the two conditions and which need not be here enumerated. In doubtful cases we should pay attention to the family history of the child. We should give a child the benefit of the doubt in treatment but the prognosis must needs be fatal if the case is tuberculosis.

HYPERPLASIA AND TUBERCULOSIS OF THE PHARYNGEAL TONSIL.

Piffel (*Zeitschrift fuer Heilkunde*, Aug. 1, 1899) gives a complete sketch of this relationship, including the history and bibliography. Meyer, who first described "adenoids," appeared to believe that the condition might be looked upon as a lesion of scrofula. Many authors have since put forth an analogous claim, and Troutmann went so far as to call the "adenoids" an outspoken tuberculous manifestation. However, a number of distinguished rhinologists upheld a contrary opinion, preferring to see only a phase of "lymphatism," devoid of specificity, in these formations.

It has not infrequently happened that the pharyngeal tonsil has been discovered post mortem to be the seat of active tuberculosis, and Lermoyer has described tuberculosis in this gland. The specific affection may be outwardly indistinguishable from ordinary hyperplasia. After Lermoyer, Dieulafoy took up the study of the subject, making inoculations with positive results in 20 per cent of his experiment animals. Cormil threw cold water on these results by pointing out some fallacies—for example that tubercle bacilli might have lodged in the crypts.

Piffel was led to investigate the subject afresh by Prof. Zaufal of Prague, who furnished the necessary material from his nose and throat clinic. The work has occupied a long period of time and meanwhile other authors have published their results. Broca repeated Dieulafoy's

experiments without a single positive result, and Brieger had no better success. Brindel, however, obtained about 12 per cent. positive results, and Gottstein was also able to corroborate Dieulafoy. Numerous other investigators have since reported both positive and negative results, so that the proportion of tuberculous adenoids fluctuates between 0 and 20 per cent. Piffi experimented with 100 cases of hyperplastic pharyngeal tonsils, without selection. Histologically, tuberculosis was present in 3 per cent. only. The material was then investigated from the hereditary and clinical standpoint for evidences of tuberculosis in general. As a result there was no greater preponderance of tuberculosis or affiliated conditions (scrofula) in the families, habitus, or organs of patients with "adenoids" as compared with other patients, and therefore Piffi is unable to subscribe to the correctness of Troutmann's views.

The cervical lymphganglia were especially investigated in connection with adenoids, because Thost and Gallois found enlarged ganglia and "adenoids" almost constantly associated. Piffi found a slight degree of enlargement of the glands to be almost constantly present. Both sides of the neck and all the ganglia participated to a greater or less extent. In this group Piffi includes glands as large as a pea or perhaps a bean. These swellings often vanish after removal of "adenoids." With regard to larger ganglionic swellings, lymphoma proper, only one patient was thus affected, and he was one of three who had tuberculosis of the pharyngeal tonsil. The author is still pursuing his studies upon various aspects of this problem of the relationship of tuberculosis to hyperplasia of the pharyngeal tonsil.

ON THE RELATIONSHIP BETWEEN GLAND-SCROFULA AND PULMONARY TUBERCULOSIS.

Blos (Mittheil aus d. Grenzgebieten der Medizin und Chirurgie, 1899, No. IV.) has reported 328 cases of tuberculous lymphoma occurring in Czerny's Clinic at Heidelberg, during the period 1886-1895 inclusive. Of this number he was able to follow up the subsequent history of 160 cases for a period ranging from 3 to 12 years. He has further collected from literature the statistical records of 23 other authors upon the same subject, comprising in round numbers 2,300 cases, many of which were likewise studied with regard to terminal manifestations in the post-observation period.

Eighty-nine per cent. of Blos' cases were examples of cervical lymphoma, and the percentage obtained by other authors was even higher (Wohlgemuth, 96 per cent.) ; and his study of tuberculous lymphoma is practically limited to the ordinary cervical localization.

Based upon his clinical and literary studies, and perhaps still more upon the remarkable results obtained by Volland (to be described shortly) upon apparently healthy school-children, Bloss attempts to revive an obscure theory of the relationship between gland-scrofula and tuberculosis, to wit, that the former is the natural forerunner of the latter ; that cervical lymphoma is the primary, and pulmonary tuberculosis the consecutive manifestation. It would follow as a corollary that tuberculosis of the bones and joints and similar manifestations are likewise secondary to cervical lymphoma, while in rare instances the primary focus of the disease would be found in the bronchial or mesenteric lymph-ganglia, either with or without the association of cervical lymphoma.

Volland (*vide supra*), after examining 2500 Swiss school-children with especial reference to the state of the cervical glands, made the astonishing discovery that no less than 96 per cent. of his material (and presumably, therefore, all children) between the ages of seven and nine years presented the peculiar bilateral, multiple, indolent engorgement of those structures which is held to be due to but one cause, viz : tuberculosis. In children a few years older the percentage of enlarged cervical ganglia notably declines through resolution, while in a certain percentage suppuration occurs. With further years the percentage becomes still less until in adult life the proportion of individuals with enlarged cervical ganglia is relatively small. Of the original 96 per cent., the greater number of cases have undergone spontaneous cure, while in a considerable number the glands have suppurated or have been surgically treated in various ways. The remainder consist of those whose enlarged glands persist into adult life. Now, Volland and others have systematically examined cases of pulmonary tuberculosis with regard to enlarged cervical ganglia and have found that some degree of enlargement is almost invariably present (93 per cent.).

Bloss found, after following up the history of his 160 selected cases, that 40 per cent. developed secondary tuberculosis ; and this result taken with similar findings of others, causes him to become an adherent of Volland's views. According to this theory, therefore, glandular tuberculosis may be regarded as a benign, localized manifestation of tuberculosis which is of almost universal occurrence in childhood. There is a considerable analogy here to the "scrofula" of pigs, which is likewise a benign and localized tuberculous cervical lymphoma. While in the greater number of cases this affection in man appears to be self-limited, there is a very great number of individuals in whom the disease remains latent, and in early adult life, or whenever the defensive

forces become lowered, the bacillus becomes infectious and pulmonary consumption develops.

This theory is somewhat alluring because of the analogy which becomes evident between tuberculosis and syphilis. The so-called late manifestations of syphilis develop in about 10 per cent. of all syphilitics when the resistance is notably lowered, just as, according to Volland and Bos, pulmonary tuberculosis follows cervical scrofula.

To uphold this theory it is, of course, necessary to demolish the inhalation and infected-milk theories. Against the former Bos states that confinement, especially in prisons, produces tuberculosis without any possibility of infected air, the victim perishing by auto-intoxication from his own scrofulous glands, the determining factor being lessened vitality, due to confinement. Concerning the milk theory, Bos explains that if the milk of a single dairy cow should chance to be tuberculous, the dilution which ensues when it is mixed with other milk is so extensive that the dairy milk could not harm the consumer. Market milk, as such, cannot be made to infect guinea pigs. A pure culture of bacilli may be virulent to guinea pigs when diluted 400,000 times (by injection of 1 c. cm. into the peritoneal cavity) ; phthisical sputum may be similarly infectious diluted 100,000 times ; but milk actually infectious is rendered completely innocuous when diluted but 40 times or, at the most, 100 times.

Bos does not give much time to discussing the manner in which the tubercle bacilli reach the cervical glands ; possibly because he believes it to be sufficiently well established. The extraordinary number and variety of lesions of the eyes, nasal chambers, mouth, throat, skin of the face, etc., etc. in childhood constitute so many ports of entry for the bacillus, which is omnipresent ; the cervical glands arrest the invasion of the microbe, and enlarge. In most cases the bacillus is slowly destroyed and in a goodly number it is gotten rid of by the softening and suppuration of the ganglia—while in the remainder it becomes latent and able at a remote period to cause further infection.

Bos revives several old theories to explain the route by which the bacillus reaches the apex of the lung from the cervical ganglia. Most of which may be found in detail in special writings of a generation ago.

It will be observed that according to Bos, tuberculosis is essentially a disease of childhood, like the exanthemata. It is interesting to note that Ewald must hold a somewhat similar view, for he stated in the recent Tuberculosis Congress at Berlin that the way to exterminate phthisis was to treat the scrofulous child. While the profession will probably reject the exclusiveness of this point of view, it is probably safe to admit

that its exploiters are rendering a service to medical science in calling attention to a phase of tuberculosis which has been too little heeded of late years.

TREATMENT OF TUBERCULOSIS.

Fowler and Goodlee (*Diseases of the Lungs*, London, 1898) present this subject in a very concise form. After a section on prophylaxis, they pass on to the subject of diet. Gain in weight may be deceptive as even the poor and ill-fed may take on flesh while the disease advances. When the disease is actively progressing a greater amount of nourishment is required than when it is stationary. Hot liquid food at night relieves cough. Alcoholics are indicated when they increase the appetite.

The author next gives an account of modern sanatorium treatment as pursued in the well known German establishments.

The tuberculin reaction, of much value in testing animals, is wholly untrustworthy in man. The authors relate a case in which calcareous particles were expectorated during a course of the tuberculin treatment, the specific action of the remedy having evidently transformed a latent focus of the disease into a cavity. The tubercular fever is due to the specific toxins of the disease and not to sepsis.

Serum treatment. Maragliano's serum, practically an anti-toxin prepared from the horse, etc., like Behring's antidiphtheritic serum, has not met with much favor at the hands of the profession at large.

Nucleins and their derivations, intended as remedies which should induce phagocytosis, appear to be of value, but have not been extensively tried.

Germicides have recently been revived, and are used by inhalation, by their ingestion into the stomach and finally by parenchymatous injection. The authors use creosote, guaiacol and benzosol in routine practice upon empirical grounds, for there is not the slightest evidence that these substances exert any bactericidal action.

Tonics, such as codliver oil, hypophosphites, etc., etc., can be given with much benefit, but only when the disease is stationary.

Treatment of special symptoms. The authors regard rest in bed as the best and safest antipyretic; with this may be associated sponging the surface with tepid water. Cough with expectoration should not be checked in the day time. At night, when hot food and drinks fail to relieve, we may use codeia, etc. The authors recommend the usual remedies for checking night-sweats, but since the sweat has been shown to contain toxins, it is doubtful if suppression is indicated.

The authors conclude their section of treatment with an account of the benefits to be derived from climate and sea-voyages.

PROFESSOR CERVELLO'S NEW REMEDY FOR TUBERCULOSIS.

One of the latest additions to the list is Igazol, the discovery of which by Professor Cervello, as also the clinical results claimed by him to have followed its use have been announced in telegraphic dispatches as well as in the medical press.

The microscopical examination of this preparation, which is exclusively controlled by Professor Cervello, shows it to be a mechanical mixture of different non-crystalline substances.

Attempted solution with water, alcohol and ether shows partial results with some of the components.

Insoluble in ether, the mixture contains 77 per cent of common paraform and the per cent. is slightly increased (77.6-10 per cent.) by trituration with normal ammonia and rosilic-acid.

Soluble in ether are 4 per cent. iodoform.

The residue from the ethereal solution, when dried over sulphuric acid is about 19 per cent.

After extracting this residue with hot water and after cooling, colorless crystals appear, having a melting point of 112° C., and remaining liquid at 102° C., and which by their behavior in respect to melting point, and with concentrated sulphuric acid, are shown to be Terpin Hydrate.

Neither organic substances, nor organic combinations could be demonstrated.

Igazol is therefore approximately composed of :

Common Paraform (95. per cent.).....	80 parts.
Iodoform.....	4 parts.
Terpin Hydrate.....	14 to 16 parts.

Being a mixture of several old remedies, under a new name, without any justification of brilliant expectations but on the contrary of doubtful utility.

(EDITOR).

TREATMENT OF PULMONARY TUBERCULOSIS.

. Albert Fraenkel (Muench. Med. Wochenschrift, 1899, No. 24) read a long paper upon this subject before the Heidelberg Medical Society. Some of the points most emphasized by the author are as follows :

The number of pure "infectionists" grows smaller with each year, and

we now have two fundamental axioms, "No tuberculosis without the bacillus," and "No tuberculosis without the predisposition." The bacillus may be inhaled, yet do no harm provided there is no predisposition. Were it not for this fundamental postulate, mankind would long ago have been annihilated. Immunity to tuberculosis is in part inherited, and is of various degrees. A patient may pass through a severe attack of joint-tuberculosis and will not therefore be rendered immune to an attack of pulmonary tuberculosis. The entire question of natural immunity is a puzzle thus far, and the most practical conclusion to be drawn is that those individuals who inherit the predisposition ought not to marry; in this way the immunity of the entire race would be increased. In these marriages of non-immunes with immunes or with each other the man shows the greater degree of actual immunity, because pregnancy, lactation, etc., increase the predisposition in the woman. Healthy husbands procreate weakly children in tuberculous women, but tuberculous men may beget healthy children in healthy mothers. If the predisposed must continue to beget children, the latter ought to be raised with the greatest care. They should be taught to eat fats (which they generally abhor) and to avoid alcoholics. They should not pursue the same school curriculum as children who are presumably immune, and provision should be made for summer vacation in the country.

The great decrease in mortality is ascribed by Fraenkel to precautions taken for some years past against the drying and diffusion of sputum. Since Kitasato has shown that bacilli in sputum are largely dead or weakly virulent, it is going far enough to forbid spitting on the floor or pavement, and to insist on the general use of cuspidors and spit-cups. In forbidding expectoration we should also interdict the equally reprehensible practice of swallowing sputum, so common in women, as the chance of intestinal infection becomes thereby very great.

Fraenkel does not look upon the finding of the bacillus as of great aid in making a diagnosis. By the time it is present in the sputum, the disease is so far advanced as to be recognized readily by a good diagnostician. He believes, however, in using tuberculin for diagnostic purposes in all doubtful cases. If the temperature goes to 38.5° and 39° C. after two injections of one and two mgms., respectively, he feels safe in assuming the presence of a tuberculous focus. Negative results, when occurring repeatedly have a similar value.

Fraenkel appears to believe that the principle involved in using tuberculin therapeutically is wrong, and that the results in practice justify this view. The antitoxic serums he regards doubtfully and believes that Koch will be the man who will eventually discover a true serotherapy.

He deprecates search for a specific in the ordinary *materia medica* (creosote, cantharidin, etc.).

However, the various collateral phenomena of phthisis may be greatly benefited by the *materia medica*. Fever, especially when preceded by chills, he regards as the great indication for the use of alcohol. He believes to the fullest extent in employing every modern resource of diet and treatment of the stomach in the management of phthisis. Although the term "dyspepsia" is largely banished from modern medicine, we will still speak of the "dyspepsia of phthisis" instead of "motor insufficiency," "secretory insufficiency," and the rest of modern nomenclature.

Besides giving a full mention of the sanitarium, climate and sea voyage treatment, Fraenkel urges that the psychical management of the disease must not be neglected (as it is, notoriously). There is no disease more susceptible of being reached through the mind than phthisis.

RITTER'S TREATMENT OF SCROFULOUS CHILDREN.

La Tuberculose Infantile for August, 15, 1899, contains a reproduction of Prof. Ritter's paper upon this subject, read before the Sixty-ninth German Scientific Congress at Brunswick.

Ritter's material consisted of 40 children of laboring people, and his experiments extended over three years. The patients were allowed to attend school during the treatment.

The children were kept outdoors as much as possible on the theory that constant exposure to the sun's rays is a powerful regenerator of vitiated blood. Experiments show that animals exposed to the light have better metabolism than those confined in darkness. This influence of light upon the gain in weight appears to be even more marked than the influence of fresh air.

Ritter had observed that cases thrive much better who perspire freely. Restriction of perspiration is, in fact, very prejudicial to accumulating flesh.

Since the scrofulous child is anaemic, the diet should be dictated to correct this blood-state. If mineral salts are left out of a dietary, pure albumens, starches and fats cannot sustain life. If an animal is bled copiously it recovers slowly or not at all unless its lost blood-salts are restored. To make sure that the children were properly supplied with the right kind and amount of saline matter the composition of foods was studied with a view of determining what articles of diet would best keep these substances in equilibrium. Every child received three-fourths of a litre of milk daily, excepting those who were already plump. Cod-

liver oil was given, as a rule. The use of this remedy has unfortunately lessened within the past ten years. As much of its action is identified with the presence of fatty acids, the oil selected should be seen to have an acid reaction. The author, however, appears to prefer the artificial oil, Lipanin, to cod-liver oil.

As a general rule Ritter is inclined to favor, in the treatment of scrofula, any substance or process upon which animals regularly gain weight, provided, of course, that it is readily absorbed or applied. He enumerates in all, sunlight, fresh air, perspiration, diet which gives the proper ratio and amount of blood-salts, (milk, etc.), cod-liver oil (especially when containing free fatty acids) and lipanin, and lactate or carbonate of iron. He has experimentally proven that any of these are successful in causing animals to gain weight.

Next to these flesh forming measures, Ritter advises pulmonary gymnastics, both with a view of correcting the shape of the chest and of keeping the bronchioles free from catarrhal secretions which at times interfere with the proper expansion of the lung. The method of exercise employed is often of secondary importance.

The extreme sensitiveness to temperature changes must be overcome by frictions with water at various temperatures, becoming progressively lower. Slight colds occur, however, even after a number of weeks of this treatment, but we should not on that account give up the treatment.

The softening of the paquets of enlarged cervical glands should be prevented, and they should, if possible, be reduced in size, the indications being easily filled by massage. Each one of Ritter's cases was treated daily by this method.

The scrofulous eczema is controlled by Hebra's diachylon ointment or the inspissated extract of myrtle.

To sum up his management of cases : The children were taken from their unhealthy surroundings and placed in a locality free from dust. They were, as much as possible, exposed to sunlight. Hardening was sought in systematic cold frictions ; arms, legs and feet were habitually bare. On every sunny day they took a sand bath. Gymnastics were supervised by a special instructor. Milk, and fruit in season were freely used and a mixture of lipanin and extract of malt was given, with the addition of 2 per cent. of lime and 5 per cent. of iron.

Tests were made as to inspiratory power, weight, etc., from time to time. The results attained, as shown by a table, were uniformly excellent.

FLUORINE AS AN ANTI-TUBERCULAR REMEDY.

Philipppson (*Dermatologische Zeitschrift*, July, 1899) believes that lupus is not adapted for local treatment. Koch's tuberculin has shown us that lupus tissue may be reached from within. Cantharidin and thiosinamin have also been employed subcutaneously. Philipppson has, upon A PRIORI grounds, sought to make a trial of the fluorides on account of the chemical analogy of fluorine to iodine, bromine and chlorine, all medicinally active substances. Sodium fluoride is a harmless substance to the animal economy. The author began the use of this remedy in 1895 upon cases of lupus. In a comparatively short time healing tendencies were noted, and when the fluoride had to be discontinued on account of gastric irritation, the lupus promptly relapsed. Three centigrams of the drug may be taken three times daily for a long time without untoward results ; but this dosage is not sufficient to overcome the disease. The author then made use of the hypodermic method, at first in doses of 1 to 3 centigrams, but eventually of 10 centigrams. This latter dose provoked a severe local reaction. Use was also made of a 10 per cent. fluoride plaster.

The author is firmly convinced that fluorine has an elective action upon lupus tissue. In searching for a rationale for this action he finds that consumptive glass-workers exposed to hydrofluoric acid vapors appear to undergo an arrest of the disease, and it has been suggested to make use of this gas as an antitubercular inhalation, as tolerance to its irritating effects is soon established. The improvement in phthisical glass-workers, and the betterment of lupus, which have alike been noted, appear to the author to lead up to a very striking generalization, viz : That fluorine is a specific antitubercular remedy. After much experimentation the author has found an organic salt—parafluorbenzoate of sodium—which can be tolerated indefinitely in doses of 50 centigrams three times daily. He strongly counsels the employment of this salt in other forms of tuberculosis.

BOOK REVIEWS.

Prophylaxis and Treatment of Pulmonary Tuberculosis; by S. A. Knopf, M. D., Philadelphia, 1899, 343 pages.

The first two chapters of this book, comprising 30 pages, are devoted to a short and interesting history of tuberculosis and to mortality statistics. Chapter III recites the observations of various authors, as to healed and latent lesions found after death from other causes.

In chapter IV the author deals with the communicability of the disease, and with individual prophylaxis. He thinks that an individual perfectly well will not be harmed by the inhalation of tubercle bacilli, a somewhat dangerous assertion, which at best admits of no proof, on the contrary quite a number of consumptives claim to have been, and to all appearances really were, in good health before the advent of their disease, and we cannot acquiesce in this statement unless it is granted that no one, or but very few persons enjoy that degree of health. This is all that the author says on the matter of predisposition or resistance to infection which plays so important a part in the acquirement, and often in the course, of the disease.

In individual prophylaxis the author dwells on the dangers and their prevention of inhalation or ingestion of tuberculous material, dust and foods; and numerous devices of cuspidors are described and illustrated, for the better and more effectual collection of tuberculous sputum. The co-existence of pharyngeal and laryngeal tuberculosis the author believes to be not infrequently due to the inhalation of dried dust, from handkerchiefs into which the patient has previously expectorated.

While the dissemination of the infectious material by careless disposition of sputum has always been insisted upon, we would suggest that the infection of the larynx in cases of pulmonary tuberculosis is more readily accounted for by loss of epithelium through irritation of the secretions in their outward passage than by inhalation of particles of dust from an infected handkerchief, and the like holds good of the pharynx, which, contrary to the author's belief, is but rarely the seat of the tubercle, owing to the mechanical hindrance for localization of the germ.

The pocket flask of the author is an improvement on the Dettweiler pattern, but to the use of either there is much objection, especially by sensitive patients. In our experience with the use of expectoration flasks it was found that most of the patients who would accept them, used them only when they were being observed by the medical officers of the

institution, and were not infrequently caught expectorating into their handkerchiefs, though they had their flasks in their pockets.

As to the danger from saliva of tubercular cigar makers, and other remotely possible causes of infection, as, for instance, the deposit of tuberculous dust upon bread in bakeries, the caressing of animals and pets, transmission of the germs by earth worms, infection through marital relation, tattooing and the danger of infection by the speaking of a consumptive, they may be admitted as of possible, but not as of probable occurrence ; with an unclean, ignorant, careless patient, his whole environment is more or less contaminated, and the greater the predisposition of those who come in contact with him the more probable is their infection. We should, however, prefer to warn about occupying the room in day time with such patients, and especially after dry sweeping, when the dust of the room is stirred up and in suspension, rather than against sleeping in the same room at night, when the dust has settled to the floor.

While rare sources of infection are properly mentioned in a work of this kind, the author would have done well to have allayed undue fear on the part of both the profession and the laity by stating the remoteness of the danger, and we repeat that the tubercular patient, under reasonable instructions and conduct on his part, does not become a source of danger to his fellow man, and this even if he does not wear a mask over his face.

The danger from vaccination which the author mentions deserves special attention ; and it must not be confounded with the danger of transmitting syphilis with lymph taken from syphilitic subjects. In syphilis the tissue fluids of the body are infectious, but this can be so only under exceptional and special conditions in tuberculosis. The latter is usually a local disease, and neither the blood nor the unaffected tissue contain the germ. Only in acute general miliary tuberculosis can that be the case, and it is not probable that a human being or an animal suffering from such an acute and rapidly fatal infection would be used for the obtaining of vaccine lymph. L. Meyer (*Vierteljahrsschrift fuer gerichtliche Medicin*, Vol. 37, No. 2) and Acker (*Centralblatt fuer allgem. Gesundheitspflege*, Dec., 1884, and *Deutsche Medicinal Zeitung*, 1885, No 29), never found tubercle bacilli in the lymph or crusts of consumptives which were vaccinated in an advanced stage of their tubercular disease, and there is yet to be supplied the first case free from sources of error in which such an infection is shown to have occurred. The only possible transmission of tuberculosis by vaccination is by the use of unclean instruments, or by infection of the wound with tuberculous material incidental to the minor operation, and this must be exceed-

ingly rare, if it occurs at all ; and then the infection occurs in a like manner, as in the rare instances of tubercle formation from tattooing, the germ gaining access by accident from without.

The danger to a household from tubercular pets, such as parrots and canary birds, to which the author calls attention, does not exist. He evidently believes avian tuberculosis to be transmissible to mammalia which is erroneous. Dogs are practically free from tuberculosis unless purposely and directly infected experimentally, but cats are more frequently tubercular, and although they cough not, neither do they expectorate, they may possibly become dangerous to children who pet and caress them.

Likewise we consider disinfection of tubercular alvine discharges as unnecessary, tubercle bacilli perish quickly in all decomposing organic substances, and with people who are at all decent, and would be in a position or likely to disinfect such discharges, their usual disposal is safe enough.

We find less occasion for criticism in Chapter V, dealing with public prophylaxis, recommending compulsory report of tubercular patients, proper supervision of public and private institutions, hotels and boarding houses, disinfection of rooms and houses, public conveyances, theatres, etc., and of circular instructions to the interested parties and to the general public ; these propositions cannot be too often repeated, and compliance should be insisted upon at all times. That, however, there is any material danger of infection from street dust is open to doubt. Only upon street surfaces where expectoration is habitual, have tubercle bacilli ever been found, and while sprinkling the streets is useful as a precaution, and is desirable for other reasons, infections from such dust are rare, if they occur at all.

Tubercle bacilli in the open air and especially in sunlight soon lose their virulency, and Cornet has shown that among street sweepers, though following their occupation for many years but leading an out of door life, tuberculosis is less frequent than among many other callings, where no such constant exposure to street dust takes place.

We cannot possibly see any danger from ordinary burial of the tuberculous dead, and cannot agree with the author that cremation would constitute one of the means of stamping out tuberculosis in the human race. As already stated most of our objections are not to the mention of remote possibilities which may be of interest to the profession, but to the danger that, without pointing out the remoteness of infection, we will be considered pedantic and extreme, and that thereby the real object,

viz. : the early inauguration of practical measures for prevention, will suffer.

No reasonable person will object to precautions such as the author and many others have recommended for the care of sputa, inspection of tuberculous animals and of food supplies, nor to proper care, cleaning and disinfection of sick rooms and houses, the supervision of factories and the proper allotment of air space for factory hands, ventilation of work shops, etc., but when we want to see danger in earth worms, in bread because it is not wrapped in paper while hot, before it reaches the customer, in sexual relations and in the burial of the tuberculous dead, etc., we are liable to be accused of "swallowing camels while we strain at gnats."

An interesting resume is given by the author in Chapter VI, of State laws, for the prevention of infection, especially from animals, and explicit directions are given for the application of the tuberculin test. The recommended dose of .25 c. c. for a full grown cow or bull is, however, not enough, and .5 c. c. is the usual dose, which in animals of large size should be increased to .7 c. c.

In the chapter on preventive treatment there is much to commend and Chapter VIII, on Sanatoria at home and abroad, giving the author's observations in his tour of visits to many such institutions, contains many practical and useful hints on climato-therapy and on the general management of patients. We should, however, have preferred to have part of this space (120 pages) devoted to the diagnosis and general symptomatology and course of the disease, which the author has not included in his work, and the absence of which detracts much from the value of the book for the general practitioner.

The open air treatment, rest cure and exercise described in Chapter XII as in use in institutions, are instructive and may, at least to a degree, be carried out in private practice.

Chapter XIII deals with the use of Pneumatic Cabinet, and its importance is emphasized as an auxiliary.

It should, however, have been stated that the cabinet should not be used in the active period of the disease, forced respiration being then even a source of danger instead of benefit. So long as the patient has fever, especially in the stage of softening and excavation, this fever is increased by the augmented lymphatic absorption induced by the respiratory exercise, and if the secretions are profuse we may favor the occurrence of pneumonic processes by the deep inspirations, the sputum being aspirated into other parts.

The author believes that he has made several valuable additions to its proper use, one consisting in a change from the usual breathing tube

which is held in the mouth, to one attached to a face mask, by which the patient can breath through the nose. In our use of this instrument during 16 years and in several thousand cases, we at one time made a like change, with no advantage that we or our patients could appreciate. His second improvement the author believes to result from stripping the patients to the waists before they enter the cabinet, and having the trousers, or skirts, loosened so that free breathing shall be possible. In addition he thinks that the effects of the rarefied air upon the cutaneous surface is greater (?) than when several layers of clothing intervene.

As to the latter advantage, we cannot see why this should be so, and regarding the former, all those whom we have seen apply the instrument see to it that there is no tight or restricting clothing, to either the free expansion of the chest or to the movement of the abdomen, and we suggest that such an effect is possible without the entire removal of the clothing from the chest. To ask a patient to so expose his person for no other than theoretical reasons (which are scarcely susceptible to proof) and especially to ask this of ladies we should be most unwilling, and should hope that such patients were equally so.

Such an exposure of person by a woman, even to a physician, who must stand in front of the glass window and observe his patient, while manipulating the apparatus, is offensive to her modesty, and much weightier reasons than the author gives, would have to exist, before we could demand this in the patients' interest ; we must therefore differ with the author that his modifications will tend to increase the usefulness of the pneumatic cabinet.

The chapter on Hydrotherapeutics is practically a description of Dr. Baruch's Douche apparatus, but its application can, as a rule, only be practiced in institutions. We miss, however, useful and detailed information as to the selection of cases, and it should not be forgotten that the application of a cold douche in certain phases and stages of phthisis could be most disastrous. Chapter XVI, on dietetic treatment, is very good and will be read with interest by all. It is to be hoped that Tropon of which the author speaks highly favorable, will prove an exception to the many disappointments we have experienced from artificial food products; its value appears to have been well established, especially in Germany. The reports from the Charite in Berlin, from Dr. Winkler's institution of consumption at Goerbersdorf, and from many other sources which have come to our notice within the last two years, in foreign medical literature, would show it to be an important addition to our resources in the dietetic treatment of phthisis, the more so as it is af-

forded at a reasonable price. The gain in weight observed from its use is remarkable.

Most of the symptomatic treatment in Chapter XVII is also commendable ; the author thinks that blistering and other forms of counter-irritation are being neglected in this country in the eager pursuit of "something specific." However this may be, we fear that the author gave his fancy rather more free play than have those, who seek after specific remedies, when he sees in counter-irritants a means "to draw from the delicate respiratory and circulatory organs countless dangerous micro-organisms into the less delicate cellular tissues, where by the action of these irritants, the number of phagocytic white corpuscles has been increased ; and thus an actual destruction of pathogenic microbes is brought about by the simple mustard plaster, the old-fashioned dry cups or the points de feu (igni puncture)" for here we would have a GENERAL specific par excellence, and one which would make further search for anything else entirely superfluous !

For cases of repeated hemorrhages in the the absence of demonstrable physical signs of sufficient cause for the bleeding, the author finds the only explanation to be a haemophilic diathesis and recommends iodide of potash to overcome the fragility of the blood vessels, which to us appears a questionable proposition. Excepting this and the mustard plaster, and objecting emphatically to the use of coal tar products for the control of fever, as advised by the author, we cannot but commend the symptomatic treatment given, though our experience with antistreptococcic serum was entirely negative. We know of no means to distinguish pyogenic strepto-cocci from the benign form of strepto-cocci of mucous membranes, except by the tedious and difficult process of plate culture. In some cases which we so determined, we found only strepto-cocci of the non-pathogenic varieties, although the patients had hectic fever.

Equally good is the chapter on laryngeal and other intercurrent affections and complications, but in pneumo-thorax the author should have distinguished between the partial and complete form, and those where cavity contents enter the pleural sac, and he should have mentioned the usually fatal import of the latter.

The succeeding chapters are devoted to considerations of prognosis, marriage, childbirth and the conduct of consumptives in health resorts.

The parts dealing with the treatment of the consumptive poor in special hospitals, the treatment of ambulant tuberculous patients in private and dispensary practice and in their homes, all contain excellent advice. The printed instructions which the author has devised for consumptives

for his dispensary cases are excellent, and with a few modifications should be placed in the hands of every patient, no matter whether he is treated at home, in sanatoria, or in open health resorts.

The advantages from terebinthinate vapors, from pine trees, and in their absence the author's advice of their artificial substitution as curative agents, seems to us to be rather problematic, and the quoted delay of a final fatal issue in three infected dogs who were subjected to such vapor need not necessarily be credited to turpentine.

A strong appeal is made for the erection of special institutions for the consumptive poor, and much credit must eventually come to the author for his unceasing efforts in that direction.

The statistical tables as to clinical results under various methods of care are open to the usual objections, namely, that there is no uniformity in the classification of what constitutes a really cured patient. It is equally so with improvements, and if, as I believe, many cases are reported as cured, in which the disease has simply become latent with more or less lasting disappearance of symptoms, or if a slight gain in weight or strength or moderation of cough and expectoration constitute improvement, the accomplished results shown in statistics are, of course, much better than if much more is demanded. Like sources for misleading statistics arise out of the nature of the clinical material, the proportion of truly early, middle stage and advanced cases, the length of time the patients were under treatment, etc. If uniformity in estimation of results and in classification could be secured, the author's statistical tables would probably make a different showing, and they could then more readily settle the question as to the value of specific and other remedies.

Comparing the results as tabulated by the author for different institutions, the date of the reports should have been given; for the institution under our charge, the percentages given are those obtained quite a number of years ago, and have greatly improved since that time. The statistics for the Chestnut Hill Hospital appear incomplete as tabulated on page 314, the total of percentages for all cases footing up $43\frac{1}{2}$, leaving the question open as to what became of the other $56\frac{1}{2}$ per cent.

In conclusion we may say that while we have offered some criticisms, with few exceptions these refer to less important matters, and in some instances to simple differences of opinion, which might be taken into consideration by the author in subsequent editions of his work, and in which we hope he will also consider the subject of inherited and acquired predisposition; and add at least one chapter on the clinical course of the disease, on diagnosis, and on complications, so that the work will be a more complete and practical guide to the general practitioner.

Die Tuberculose; by Professor Dr. G. Cornet of Berlin. Vienna, Alf. Hoelder, 1899, 674 pages.

This volume is one of a series of a system on Special Pathology and Therapy, edited by Professor Nothnagel, and is by far the most complete treatise on the subject of tuberculosis in modern medical literature.

There is nothing but satisfaction to the reader of this splendid work, which in all respects bears the stamp of critical examination, study and investigation of all that pertains to the subject.

Everywhere one notes that the distinguished author brought to his undertaking a vast amount of practical experience, and the volume is just what we would expect from Professor Cornet, whose labors and original investigations in Tuberculosis are well known to the profession not only in Europe but in America also.

The only wish that we can express is, that this book will be speedily translated into English so that its rich treasures of facts and practical information may become available to the whole of the American profession, being fully convinced that the prevention and treatment of tuberculosis will be greatly enhanced thereby.

TUBERCULOSIS AND QUARANTINE.

The Medical Record of September 23, contains a timely editorial on the above subject, in connection with the proposed legislation of the State of California which, based upon the ground of "the contagiousness of tuberculosis," shall prevent tuberculous persons and animals from entering that State.

The position of the editor of the Record will be endorsed by every practical sanitarian and conservative worker against the spread of the disease. Even if such extreme legislation were really desirable, the impossibility of an effectual quarantine, especially against infected persons, is so obvious that one can hardly understand how it could be seriously proposed. We repeat, however, what we have time and again emphasized, that the tuberculous patient, who is properly instructed and who exercises reasonable care, is not dangerous to his fellow man, and while we could not entertain the proposition that the specific germ, instead of being a causative element in tuberculosis may be merely an associated or resultant condition, we are fully in accord with those who see the necessity of a favorable soil to its colonization and invasion in the living body to which it gains access from without; subscribing still to the dictum "Without the specific bacillus no tuberculosis," but also to a second one, viz: "Without the predisposition no bacillary infection."

(ED.)

SUPPLEMENT TO THE JOURNAL OF TUBERCULOSIS.

In this part the whole subject of Pulmonary Tuberculosis will be covered by a continued series of articles written by Dr. Karl von Ruck. Articles already in print will be revised, and republished, and others will be written new, appearing in the following order.

Article I.—The cause of Tuberculosis, and the conditions which predispose to its acquirement. Article II.—The Prevention of Tuberculosis. Article III.—The Pathology and Symptomatology of Pulmonary Tuberculosis. Article IV.—The Diagnosis of Pulmonary Tuberculosis. Article V.—The Prognosis of Pulmonary Tuberculosis. Article VI.—The Treatment of Tuberculosis, dietetic, hygienic and symptomatic. Article VII.—The Climatic Treatment. Article VIII.—The Specific Treatment. Article IX.—Laryngeal Tuberculosis, its diagnosis and treatment. Article X.—Institutions for the Treatment of Pulmonary Tuberculosis.

THE PREVENTION OF TUBERCULOSIS.

(CONTINUED FROM PAGE 176.)

With the great majority there is little prospect for such proper and consistent action which shall assure the greatest degree of health. Even in our profession we meet constantly with examples where excessive devotion to duties with incident exposures, or perhaps, bad habits, have brought about serious physical deterioration and in consequence the advent of tubercular disease.

Not until our modes of thought, reason and feelings, have been so changed that we can readily desire to exchange more immediate gratification for the prospect of continuous good health and longevity will there be any material change.

There are, however, some things that we can do, and the few practical suggestions which I offer may help those who are in danger of losing their inheritance before it comes into their own keeping.

I refer to the feeding and hygiene of infants under the present tendency to reach out for artificial foods, and for substitutes for the mother's milk, or for that of a healthy wet nurse.

There is no doubt that such infants who survive under artificial feeding have often been seriously and perhaps permanently injured, if not already infected, and mothers should not be lightly excused from the duties of maternity.

If artificial feeding becomes imperative, we should not abandon the use of milk, if it comes from a perfectly healthy animal, until we have thoroughly demonstrated, that although after sterilizing and properly proportioning it, it really cannot be borne by the infant.

It has been my observation that mothers and physicians often conclude too quickly, that the particular milk does not agree : in many instances the gastro-intestinal disturbances attributed to the milk have been set up by giving it in excessive quantity, by using milk which has undergone fermentative changes, or by feeding the baby other things unfit for its digestive organs.

In others, the interference with proper digestion by sickness, especially when of a febrile character, is lost sight of, or is not sufficiently appreciated, and the solicitous mother who measures the degree of illness and improvement by the relative amount of food taken by her child, is very apt to err in taxing its digestive powers beyond endurance at a time when really very little can be properly digested.

The digestive organs once in a state of irritation or catarrhal inflammation, are no longer tolerant as they were before, and even the most perfect mother's milk will now be likely to disagree, if freely given. Instead of changing from the mother's milk to cow's milk, or from the latter to artificial food, the indication is, to restrict the amount or to abstain from feeding altogether for such time as the conditions in the particular case require.

Many infants are launched upon the artificial feeding process in just this manner, without real justification, to be thereafter exposed to the perils which attend it, and though frequently carried through to the period when other foods can be digested and assimilated, it has been at the cost of more or less permanent injury to the child's constitution.

For the proper nourishment of infants there is as yet no perfect substitute for human milk, and the nearest we can approach an equivalent is with milk from animals which in this country at least must, as a rule, be cow's milk. The latter is also the best food with which we can supplement the demand in quantity as the child grows older and larger, or as the maternal supply becomes inadequate. Eventually cow's milk should take the place entirely of maternal milk to be itself supplemented by the gradual introduction into the child's diet of starchy, fatty and nitrogenous foods.

With watchful care and supervision of the child's diet adapted in quantity and quality to its age and growth, the nitrogenous foods and animal fats are gradually increased to their full limits. If then the bodily hygiene is good and the environment is healthful, and if out of door life and exercise are regularly alternated with proper rest, as heretofore indicated for those who are hereditarily predisposed, we will rarely find loss of appetite, and rejection of fats and meats on the part of growing children.

Parents who so supervise and direct their children's mode of life, and conduct, to the age of full maturity, and who teach them proper self-restraint and generous conduct toward others from infancy have laid a foundation which will be lasting, and the structure will in all probability prove impregnable to the worst enemy of human health and life, "The Bacillus of Tuberculosis."

III.

THE PATHOLOGY AND SYMPTOMATOLOGY OF PULMONARY TUBERCULOSIS.

The infectious character of tubercle was known and recognized long before the discovery of the specific germ by Prof. Koch ; and the belief in the contagiousness of tuberculosis or consumption dates back several centuries. While it was not developed through bacteriological research, the varied theories as to the actual contagion and to its mode of transmission were changed, corrected and precisely formulated by this more recent branch of medical science.

Prior to Lanneck, much confusion existed as to what really constitutes tubercle. At that time all caseous tissue was accepted to be tubercular, caseous degeneration being the distinctive feature.

Later, Virchow showed that caseation can occur as a result of inflammation, entirely apart from tubercle, a discovery which led him to accept only the disseminated miliary tubercles as true and characteristic, and to attribute the caseation of nodules and of the larger masses to inflammation only.

Villemin, however, brought additional light by demonstrating through inoculation of animals the infectious nature of tubercle whether caseous or not, and Cohnheim, confirming Villemin's results, insisted upon the animal experiment, as the only reliable test for distinguishing true tubercle from other caseous and inflammatory products and degenerations.

The opposition to Villemin and Cohnheim attempted to discredit their experiments, by showing that various foreign substances, especially finely powdered glass (Sanderson), when injected into the blood gave rise to the formation of tubercles, which histologically were identical with those claimed to result from inoculation with tuberculous virus.

But the animal experiment again cleared the way of obstruction in demonstrating that Sanderson's tubercle was not true and specific, inasmuch as its transplantation failed to cause the formation of new tubercles, while such a result always followed, when true tuberculous ma-

terial was used, and that such transplantation of true tubercle could be continued indefinitely.

Acquirement of greater skill in the technique of inoculation and increasing experience in avoiding sources of error, were thus rapidly establishing the inoculation test as the only scientific mode of distinguishing true tuberculous disease from other affections, when Professor Koch's discovery of the bacillus brought order, precision and agreement, removing forever the confusion, contradictions and controversies which had previously prevailed.

We now know that true infectious material is only produced as a result of the presence of the bacillus of Koch, its occasional absence being explained by either the prior disappearance of the germs from the tissues examined, or by the difficulty of demonstrating them with the usual method of examination.

In the instance of failure to demonstrate the bacillus microscopically, when nevertheless tuberculosis exists, inoculation of animals is still a valuable method, as it proves its presence by the occurrence of tuberculosis, and now, as before Koch's discovery, the inoculation method is the final and crucial test in doubtful specimens.

HISTOLOGY OF TUBERCLE.

When the bacillus of Koch has gained access to living tissue, it produces there certain definite changes, due in part to its presence as a foreign body, and in part to its growth and multiplication and to its toxic products.

Like other foreign substances embedded in living tissue, the tubercle bacillus causes local irritation, manifested by the attraction of polynuclear leucocytes and by subsequent proliferation of the local fixed tissue cells.

Unlike inorganic irritants such as powdered glass or metallic particles, the irritation due to living and multiplying tubercle bacilli lasts longer and is attended by inflammatory changes of a productive character and by exudation.

According to the tissue invaded, its cellular elements take part in the new formation ; thus the local connective tissue cells, the epithelium of mucous surfaces and serous membranes, or the endothelium of vessels proliferate and undergo indirect division (Karyokinesis) forming the so called epitheloid and giant cells.

The polynuclear leucocytes become gradually replaced by mononuclear forms, and with them the miliary tubercle is completed, requiring from ten to twenty days for its formation.

It now appears as a grayish non-vascular cellular node about the size

of a mustard seed, built up of epitheloid cells, giant cells and mono-nuclear white blood cells between and within which but especially in the giant cells one or more tubercle bacilli may be found.

In the formation of the tubercles the local tissue fibres are separated, loosened and partially destroyed, the remaining isolated fibres forming the reticulum of the tubercle.

Some authors, however, believe, that this reticulum is produced artificially by the method of fixation in the preparation of specimens, and still others see in it a branching and intercommunication of the processes of giant cells with a tendency to fibroid transformation.

This more common form of tubercle, also called the epitheloid form, differs from the lymphoid form chiefly by the size of the cellular elements, but it is doubtful that any real justification exists for differentiating between the two.

The lymphoid form is distinguished by the early presence of many mono-nuclear leucocytes, which are smaller and give the tubercle a small-celled appearance.

As the inflammatory changes become more pronounced, these small mono-nuclear leucocytes appear also in great numbers upon the periphery of the epitheloid tubercle, and may often be seen in the state of transition through the walls of the adjacent capillaries ; and penetrating the epitheloid tubercle they can change it to the lymphoid form.

These cells, becoming closely packed and compressed upon the periphery, form the boundary between the tubercle and the adjacent tissues.

With their multiplication the tubercle bacilli gradually occupy more space, they find their way passively into adjacent open lymph spaces and may be carried forward with the lymph stream, or they may be transported bodily by leucocytes to near or more distant parts ; in either case and wherever arrested the local irritation is repeated, the cellular inflammatory and exudative changes are reproduced, and new tubercles are formed as before.

THE DESTINY OF TUBERCLE.

While degenerative changes may succeed immediately after the tubercle has been formed, more recent observations indicate that degeneration may not only be delayed, but that it may not occur at all.

Resolution of the tubercle may occur, probably coinciding with the perishing of the enclosed tubercle bacilli, at any rate the aggregated cellular elements may disappear and leave no apparent trace of the pre-existing tubercle.

Such observations have been quite numerous, especially under the influence of specific remedies, and I have upon many occasions been able

to witness myself, isolated gray tubercles to disappear upon visible mucous membranes.

Better established and susceptible to histological demonstration is the next most favorable change, namely fibroid transformation, the cells becoming organized in connective tissue fibres. In such fibroid tubercle the bacilli may maintain themselves lying between the connective tissue fibres, but they soon lose their virulency and eventually disappear.

The most common change of tubercle is the caseous degeneration ; the leucocytes and subsequently the epitheloid and giant cells show cloudy swelling of their protoplasm, their nuclei disappear and lose their staining properties, the cells shrink and undergo fatty and hyaline changes constituting the yellow tubercle or the so-called coagulation necrosis of Weigert.

Even at this stage resorption of the cellular detritus may occur, otherwise the mass becomes more and more uniform and dry, constituting the caseous tubercle; a firm, yellowish kernel either small and of the size of the primary form, or larger when a greater number of adjacent tubercles have become consolidated into a nodule.

The caseous tubercle may continue as such for a long time, becoming enclosed in a connective tissue capsule and with shrinking of the capsule it may finally undergo pressure atrophy.

The tubercle bacilli in such caseous tubercle or in aggregates of them perish gradually, but those located more peripherally survive longer ; lime salts are at times deposited within such tubercle, constituting the calcareous degeneration which is, however, more frequent in cattle than in man.

The larger aggregates of caseous tubercle form masses sometimes of considerable size, showing more or less fibrous tissue between them and upon their periphery.

The future of such a tubercle or of tubercular nodules and masses may be permanent encapsuling ; the shrinking of the capsule shutting them off entirely from the neighboring healthy tissue and from the circulation, and they may also continue for many years, and cause no further disturbance.

Often, however, softening and liquefaction occur at times years after the patient has been considered in good health, and to have recovered. Whether this occurs as a result of other bacteria reaching the caseous mass, or independently, is still an open question.

Judging both from a clinical and pathological standpoint, I should incline to the belief that both is possible.

Other bacteria can certainly bring about such a change and they need

not necessarily be the pathogenic strepto-cocci or staphylo-cocci, but the ordinary bacteria of decomposition which are always present in the air, could induce such a change, if they reach the tubercle from the bronchial mucous membrane.

For the participation of such bacteria speak the facts that caseous masses may lie dormant and show no softening for many years, that when softening is observed it is most frequently coinciding with, or immediately following, some acute inflammation of the air passages, such as occurs in measles, influenza, bronchitis, typhoid fever, etc., justifying the assumption that the germs which produce such inflammation may also penetrate the mucous membrane, especially when it has been altered or when its nutrition has been interfered with, from pressure of an adjacent encapsuled caseous mass.

For independent softening speak the facts that dead tubercle bacilli have been proven to produce aseptic abscesses in the animal experiments and clinically we find tubercular abscesses, entirely free from other germs than tubercle bacilli and indeed these are often absent as well.

In pulmonary tuberculosis the discharges from a cavity just opened is often entirely free from all kinds of other bacteria than tubercle bacilli.

Furthermore, and as a rule, caseous tubercle soften and liquefy from the centre rather than from the periphery as we would expect, if other bacteria had gained access from without.

The pathologists naturally incline to spontaneous softening and ascribe its occurrence to the tubercle bacillus itself, while the clinician would favor the theory of the incidental access of other germs to the caseous tubercle capable of causing suppuration or liquefaction.

However this question may be finally settled, there is no room for controversy that if not always present before outward discharges takes place, other bacteria soon gain access to the interior of pulmonary cavities after they have opened and become accessible to the air.

MODES OF INFECTION.

Much light has been supplied by experimental investigations as to the modes and points of entrance of the tubercle bacillus. It has been shown that animals become tubercular whenever the bacillus is brought into intimate contact with the mucous surfaces and Cornet has succeeded in infecting guinea pigs by rubbing the germs into the skin.

Professor Koch has shown that tuberculosis occurs quite frequently in guinea pigs when they are fed tuberculous sputum, or other ma-

terial containing tubercle bacilli, and Johnne (1) obtained 47.7 per cent. of positive results in 259 animals which were fed substances containing the germs. Baumgarten, Frank, Wesener, and many others have since supplied evidence to the same effect with a varying percentage of positive results.

The entrance of the germs through the respiratory organs and alimentary canal, is, therefore, conceded on every side, and more recently it has been shown that with such entry, the tubercle bacilli need not necessarily localize themselves in the mucous membrane, but may pass to the lymph channels and glands, or even reach the blood without producing local lesions.

After the tubercle bacillus was discovered, inhalation experiments were made upon animals by many investigators and upon a large scale. The frequency of pulmonary tuberculosis naturally suggested that the infection occurred directly through the advent of the germ in the air passages, and the expectation of positive results was further justified by the well established occurrence of deposits in the lung parenchyma of mineral dust, as demonstrated by Fenken, Arnold and others.

Positive results from sprays were especially shown by Tappeiner (2), Koch, Cornet and others, but Baumgarten and some Italian and French observers denied that the inhalation of dry, powdered tubercular sputum was as a rule followed by tubercles in the lung. Indeed, even Cornet's experiments were but rarely successful. More recently, however, Cornet (3) demonstrated before the Berliner Medical Society (March 16, 1898) 48 animals, 46 of which became tubercular from inhalation of powdered tubercular sputum.

The powdered sputum was placed upon a rug, and the animals were kept upon it for several days. Cornet thinks this method corresponds more to natural conditions, and sees the cause for previous failures in the hygroscopic properties of dried sputum, which when coming in contact with the expired air of the animals, absorbed enough moisture so as to prevent its continued suspension in the air.

Experimentally it has been further shown that the tubercle bacillus may enter through the skin, especially if a slight defect or erosion was first produced by scratching, rubbing, etc. In all such cases the infection was uniformly successful. Like successful results followed the rubbing in of tubercular sputum into the mucous membranes of the eyes, nose, mouth, vagina, the male genital organs, and the rectum of

(1) Die Gesch. der Tuberculose ; Vogel, Leipic. 1883.

(2) Archiv fuer Klinische Med. 1881, Vol. 29.

(3) Deutsche Medicin. Wochensch. No. 13, 1898.

guinea pigs, and rabbits ; and though in some instances the mucous membranes remained free from tubercle, the nearest glands became caseous, and general distribution of tubercle occurred afterward.

Subcutaneous, intra-peritoneal, and intravenous infections are invariably successful, and clinical observations in the human subject appear to justify the assumption that in a general way, at least, the infection of man can occur by the same modes, and through the same channels, as have been proved to succeed in the animal experiments.

In its clinical course, also, there is much resemblance if not identity of the tubercular processes in man and in animals, and, as already indicated, the most marked difference in the distribution of tubercle depends upon the mode of infection and upon the constitutional resistance which the individual organism offers to the growth and multiplication of the germs.

In the latter respect there are important differences between different species of animals and between individual animals of the same species. Thus, while a guinea pig invariably succumbs in the end to the disease, rabbits, dogs and other large animals may recover, and even the highly susceptible guinea pig of the same age and size may show a relatively slower or more rapid course, according to environment and general care before and after the inoculation.

In the human subject the more frequent modes of infection are undoubtedly through the respiratory apparatus, and the alimentary canal, infection through the blood occurring, as a rule, only when some pre-existing tubercular focus has broken into the vascular system, or when direct absorption into the blood from mucous membranes has occurred.

The primary localization occurs usually in the nearest lymphatic and glandular structures, and this, I believe to be true of the lung, as well as of the alimentary canal and of all other points of entrance.

The experiments which apparently prove the contrary do violence to natural conditions ; as, for instance, when we spray tubercle bacilli into the air passages, and the only deduction that can be made from such experiments is, that it is possible to reach the ultimate bronchioles and even the alveoli in this manner, while it should not be forgotten that like experiments in the hands of quite a number of reliable observers were negative.

Experimental inhalation of finely powdered inert substances has shown, in man, that by far the greater amount is arrested in the nose, only a small quantity reaching the pharynx, very little reaching the larynx, and still less the trachea.

If the infectious dust must pass the comparatively longer distances

over the moist surfaces of the trachea, and over the repeated angles of diverging bronchi, with constantly diminished calibres, and if we take into consideration the small amount of air that leaves the alveoli and the supplying bronchioles in ordinary expiration, and that the air which re-enters, comes from the column lying immediately in front, and not directly from the external dust-laden air in the nose, pharynx or trachea, and that some time must elapse before the air from a given inspiration, reaches the alveoli by diffusion, we must see that the chance for infectious dust being deposited in an alveolus seems very slight indeed, and less liable to occur in man than in guinea pigs, the distance to the alveoli and the length of time the dust will have to remain suspended in the air being much greater.

It having been shown that tubercle bacilli may pass the mucous membranes without leaving any recognizable change, and that they may be carried onward passively in lymph spaces and channels, or by leucocytes, it is not improbable that they may also pass a lymph gland provided it is not previously swollen or otherwise altered to impair its functions, and the successive involvement of one after another of a chain of cervical glands would prove this.

However it may be, it is true that neither the method of transportation through the lymph stream, or by leucocytes accounts satisfactorily for the predilection of tubercle to appear first in the acini and alveolar walls of the apex, neither does the direct inhalation of the infectious dust into the alveoli, nor the advent of infectious tuberculous material into the blood do this; in the one case, it is not probable that the inhaled dust would only be deposited in an apex, and again in one to the exclusion of the other, and in the other case, that the blood would carry its infectious material to such a circumscribed locality and nowhere else. More acceptable and consistent with clinical experience is the theory again brought forward by Volland, Wohlgemuth and Bloss (1), that the lung infection is secondary to tuberculosis of the cervical glands, and occurs by local extension.

Volland examined 2500 school children and found that in 96 per cent. of his examinations these glands were enlarged at the ages between seven and nine years, the number decreasing as the children were older.

The simple fact, however, that enlargement of these glands was present, does not prove their tubercular character, for in many chronic and acute affections of the nose, tonsils and pharynx, enlargement of the

(1) Mittheil. aus den Grenzgebieten: 1899, No. 4.

cervical glands may occur, and we also note it at times during the period of first and second dentition.

If, however, over 40 per cent. of the 160 cases of enlarged cervical glands reported by Blos showed pulmonary tuberculosis at a later period, and knowing that artificial infection of the nasal mucous membrane is uniformly followed by tuberculosis of the cervical glands, without local lesions necessarily occurring in the nose, there may, after all, be justification in reconsidering this mode of infection, and of its extension to the apices of the lungs through the cervical lymphatics, since the nose constitutes the first filter of the inspired air.

Instances which support one or the other theory are constantly occurring in practice, and at the present state of our knowledge, no arbitrary rejection or exclusive acceptance of one or the other is justified.

There are instances in which we would do violence to reason, if we rejected direct inhalation, or the downward extension from a chain of cervical tubercular glands to the apex of the lung on the same side, and that the lung disease may also show itself in one apex, when it appears secondary to a primary focus outside of the chest, the following case will confirm :

The patient suffered from tumor albus of the right knee, which, so far as a most careful examination could determine, was the only locality showing tubercular disease, at any rate the lungs were and remained entirely normal prior to operative interference, neither were there the slightest subjective symptoms on the part of the lung up to, and for a month after, that time.

The patient was not knowingly exposed to an air infection either before or after the operation, the joint had not discharged externally before surgical measures were adopted ; the operation was made by a most competent and skillful surgeon with every precaution as to the complete removal of diseased tissue, and the wound healed promptly and permanently.

Nevertheless, in the fourth week after operation, the patient showed slight rises of temperature, a slight hacking cough appeared and rough breathing with fine apex catarrh was noted in the right upper lobe. The subsequent course showed undoubted disease of this upper lobe while the middle and lower lobe on the right side and the left lung remained free of disease for more than a year thereafter ; during this time the consolidation of the right apex became more marked, and upon auscultation, prolonged expiration and finally distinctly bronchial expiration with harsh inspiration was easily recognized.

Fourteen months later the patient was in good general health, free

from all subjective symptoms and attending college. At this time he suffered from a severe attack of influenza from which he failed to recover, slight cough and irregular fever continued, he had occasional chills and night sweats and tubercle bacilli were found in the scant expectoration after a slight hemorrhage which occurred on the 27th day of this illness.

Examination of his lungs a few weeks thereafter showed rough inspiration and fine crepitation in the left apex, but the lower lobes were still free from disease. On the right side a small cavity had formed above the clavicle.

Although the patient again improved, the disease in the left upper lobe became more and more evident, giving both auscultatory and percussion changes the same as had previously occurred on the right side.

The coincidence of the first lung involvement with the operation, and the coinciding of the extension to the left lung with the attack of grippe and the thereby induced softening and absorption of tuberculous material, can hardly be considered accidental, and if the observed conditions did stand in relation as I believe they did, the first lung infection must have occurred through the blood, and it is unreasonable to adopt any other theory.

Why, then, was the first lung involvement confined to the apex ?

If such can be the course and limit of extension to the lung from a distant part like the knee joint, there is no reason to reject extension through the blood from primary lesions in the lymphatic or glandular structures in other parts, or in the lung itself.

The pigmentation which we at times see in the apices and in other portions of the lung structure, and which is frequently cited as proof that tubercle bacilli are likewise liable to be carried there with the air current does not necessarily prove that either reach the point where they are found, directly with the inspired air.

Insoluble pigment particles have even been found in the costal layer of the pleura, where no air current could have deposited them, and transportation through leucocytes offers a better and, for the latter instances, the only explanation.

In many instances, however, the pigment found is derived from the blood, and has nothing to do with inhalation at all.

There is no reason to believe the mode of entrance of tubercle bacilli through the alimentary canal to be essentially different than we find it in the respiratory apparatus. Like in the latter we rarely find primary tubercular lesions upon the mucosa, and in both localities ulcerative

changes in the mucous membrane belong, as a rule, to advanced stages, involvement of the lymph glands occurring first.

When such a gland has become the seat of tubercle the blood vessels are liable to become involved by tubercle forming in their walls, and partial or complete obstruction follows. When the tubercles have penetrated to, or have directly formed upon the inner coat, the caseous detritus may be detached and carried outward in the direction of the heart if the involved vessel is still pervious, the infectious material being arrested in the capillaries of the lungs.

Isolated tubercle bacilli can pass capillary vessels. For arrestment, a specially long bacillus (which is likely to occur) or local mechanical obstructions seem necessary.

Such mechanical impediments we recognize in alteration of tissues from injury or pressure, or from present and previous inflammation; without such impediment the tubercle bacillus of ordinary length can make the rounds of the circulation indefinitely, and would eventually succumb to the germicidal properties of the blood itself.

Both in the tissues and in the artificial growth, the tubercle bacilli are frequently found in clumps, a number adhering closely together; in liquefied tubercle they are often part of the minute, caseous detritus, and thus aggregations occur which represent more than one isolated germ. When such liquefied tubercle break into the circulation, while single bacilli might pass the capillaries, the larger clumps and the caseous detritus are arrested and filtered out. Such occurrences account for multiple centres, or for the disseminated form of pulmonary tuberculosis.

Mechanical hindrances to the onward passage of single germs, in the general circulation must often be present, favoring primary deposits of tubercle in parts to which the bacillus can have no direct access, as, for instance, a joint. It is also significant that joint tuberculosis has frequently a history of preceding traumatism sufficient to justify the assumption of bruised or compressed capillaries and of retarded circulation.

The traumatism may have been forgotten, but the advent of subsequent renewal and increase of symptoms causes the injury to be remembered, though a number of weeks and months may have intervened, during which the joint gave no trouble.

It is probably so with other primary localizations, as in Potts disease, in meningitis, or tuberculosis of the genito-urinary organs, etc., in which the germs must have entered the general circulation, and it is therefore not necessary that acute, general miliary tuberculosis must follow whenever tubercle bacilli or tuberculous material enter the circulation.

For the occurrence of such general infection the bacilli must probably enter in large numbers, repeatedly or continuously, for a long period of time.

It is perhaps not of so great importance practically, to know just how directly or indirectly tubercle bacilli may get to the point where tubercles are found. Whether deposited first and directly upon the alveolar epithelium, or upon the mucous membrane of the upper and deeper air passages, and then finding their way to and colonizing in lymph glands, with later extension to the acini and alveoli, the preventive measures must be directed against their inhalation at all, and the therapeutic measures are the same no matter how the germ may have reached the diseased part.

If, however, it should be shown that the lung disease is usually a local extension of glandular tuberculosis in the neck, then the latter should receive much greater attention upon its first appearance than it does at the present time.

Its great predominance in the period of childhood has been generally recognized and insisted upon since Koch's discovery of the bacillus, and there is no question that tuberculosis of the cervical glands is the real and true representative of scrophulosis. These glands represent the filtering apparatus for the lymphatics of the mucous membranes of the nose, pharynx, mouth, the eyes, ears and the integument of the head, and in the post-mortem examination of children who die of tuberculosis these glands are almost always found tubercular. Thus Steiner and Newreutter report that in 302 of such autopsies the cervical glands were diseased in 299 cases.

Northrup found them invariably diseased in 125 autopsies, Beruti reports 88 per cent., Balman 81 per cent., Wohlgemuth 93 per cent. (1)

A predilection for tubercle formation of particular tissue is vigorously denied by some authors, especially by Cornet, but he, too, must know that, for instance, muscular tissue is relatively seldom the seat of tubercle formation, and that in other diseases, as, for instance, carcinoma, some organs and tissues are more frequently involved than others, without showing greater liability to invasion.

The lungs, for instance, are rarely the seat of secondary cancer, though the infectious or specific cancer substance must reach the new localities through the blood, and the lungs should, therefore, be the most frequent seat of secondary growths.

There is, however, every reason to agree with Cornet's general pro-

(1) Cornet *Die Tuberculose*, Wien 1899.

position, that, as a rule, tubercles can form wherever the germs gain entrance to the tissue, or if they pass through the skin or mucous membrane, that they are liable to be arrested in the nearest lymph gland, and produce their characteristic effect.

The infrequency of tubercle formation upon some mucous surfaces, as, for instance, of the nose, pharynx, oesophagus and stomach is not to be explained by greater resistance of the tissues, but by the character, quality and quantity of secretions, removal of the infectious material with food and drink and by other hindrances.

In a general way we may assume that all infections occur through the mucous surfaces, either of the respiratory or digestive tracts, excepting the isolated instances where under rare and exceptional circumstances another mode of entrance prevailed, and we may sum up this subject as follows :

1st. That the primary localization is either the point of entrance or the nearest lymphatic gland, that from it the infection extends onward, that from the lymphatics of the nose, mouth, throat and lungs, the lung parenchyma may be reached by local extension, through the lymph stream or through the blood.

2nd. That infection through the alimentary canal produces, as a rule, a primary focus in the lymph glands, from which latter the extension may reach the glandular structures in the chest, eventually involving the lung by local extension, upward, or by infectious material entering the blood to be filtered out in the pulmonary capillaries.

3rd. That primary centers of tubercle may occur in localities distant from the point of entrance of the tubercle bacillus, without intervening lesions either upon the mucosa or in the lymph glands, the germs becoming directly absorbed into the blood, and that in such case retarded circulation from mechanical causes, traumatism, previous inflammation, etc., favor their arrestment and localization.

4th. That such distant centers, whether primary or secondary, are less frequently observed because of the lung intervening as a filter, the latter being the more likely to retain the germs in areas in which present or previous inflammatory changes or other mechanical causes, such as pressure of enlarged glands, faulty development of the chest, etc., are present, interfering as they do, with free and unobstructed circulation.

SYMPTOMS OF THE FORMATION OF TUBERCLE.

Of the general symptoms attending the formation of tubercle, the most constant is elevation of temperature, the degree depending, as a

rule, upon the amount of tubercles which are being formed, the area over which they are distributed and perhaps also upon the seat of their development.

The eruption of tubercle in lymph glands rarely produces fever, and even a number of glands may undergo tuberculization without affecting the temperature.

As in other febrile affections, we miss elevation of temperature, or note a disproportionate degree in certain individuals without being otherwise able to satisfactorily explain the peculiarity, and there are cases of general miliary tuberculosis in which there are periods when the fever is slight, or the temperature is even sub-normal, while with limited involvement, perhaps of an apex, it reaches higher maxima than usual.

Toxins undoubtedly contribute to the fever, but the simple inflammatory changes peripheral to the tubercle have also a certain share in its production, and at present we cannot positively say which of the two causes is the most important.

In the circumscribed local forms, say of one apex, or one upper lobe, the temperature is quite moderate, normal as a rule in the forenoon, it rises from one-half to one degree Fahrenheit during the afternoon or evening, and returns to the normal or nearly so before bedtime.

More rapid rises and higher degrees are readily induced by conditions which ordinarily do not disturb the temperature at all. Any unusual physical exertion or mental application, playing cards, a social evening, a heavy meal or a slight attack of indigestion, causes the temperature to rise a degree or more above that observed on previous days, when neither of these causes were operative; while absolute rest, especially in bed reduces the ordinary maxima.

During absolute rest in bed the temperature may even become normal for several days, though it does not usually remain so, even if the rest in bed is continued, unless this period coincides with the cessation of the formation of tubercles.

The eruption of tubercle may extend over variable periods of time, depending upon the continuance or frequency with which the additional infecting material reaches the lung; while some tubercles are fully formed, others are in a formative stage, and the fever does not cease entirely until no more new eruptions occur.

When such a period is reached, in the course of one or two months, and if caseation and liquefaction do not follow immediately, the fever subsides entirely and the tubercular process enters upon the "latent stage."

During the formative period, the general health is more or less disturbed. There is usually some impairment of the appetite, the patient feels tired, or is easily fatigued, often he loses in weight, and he becomes paler. There need, however, be no pulmonary symptoms whatever, and usually there are none—at most there is a very slight, hacking cough, induced or increased with physical exercise, or laughing or talking, to all of which the patient becomes accustomed or pays no attention, or if he does, he refers the cough or hacking to irritation in his throat.

Unless incidental bronchial inflammation should occur from cold, due to exposure or to other causes, there is no marked cough, and certainly no paroxysmal cough, neither is there pain in the affected lung area, unless tubercles form in the pleura, then the cough is also more marked.

With the completion of the eruption, all symptoms subside, the patient feels better, grows stronger, regains his color and weight and the previous indisposition is soon forgotten. In many patients, especially of the uneducated or of the laboring classes, the whole eruptive course goes unobserved.

Such patients consider themselves well thereafter, and they may remain so for long periods of time, or always as far as their tuberculosis is concerned.

Even a small cavity may form, perhaps near the close of or immediately succeeding the eruptive stage, which heals by contraction, and leaves a cicatrix.

I have seen this to occur in latent deposits, and in the eruptive stage, without cough and expectoration, all the softened caseous tissue being absorbed without apparent outward discharge.

In other instances, I have seen the advent of bronchial inflammation, apparently to induce softening at a later period, when a small cavity formed, discharged and healed, the attending cough and expectoration being attributed by the patient, to bronchitis or to cold.

As the disease becomes latent, connective tissue changes continue and become more apparent by increased dullness in the percussion note, thus fibroid changes take place in the involved areas.

The tubercle cells themselves and the peripheral mono-nuclear cells become changed into connective tissue, caseous tubercles are encapsuled, undergo pressure atrophy and absorption, and the tubercle bacilli die out and disappear, probably for want of a sufficient supply of oxygen.

Post-mortem examinations have demonstrated the occurrence of such

latent and cured tuberculosis so often that we can say it is a frequent termination of the local circumscribed form.

Baumgarten, for instance, found such healed and cicatrized areas in one out of three or four autopsies, while Bollinger and others have observed a still larger percentage.

Such arrestment of the disease may be accounted for by the occurrence of a combination of favoring circumstances, chief among which is the degree of the patient's natural constitutional vigor, resisting power or immunity, or whatever term we may choose for the designation of a condition under which constructive rather than destructive changes take place, and by which one individual's tissues are less liable than those of another to permit the growth and continued invasion of the specific germ.

To this, however, we must add a plus, for the organism having failed, in the first place to prevent the successful establishment of the disease, something must have occurred to make the arrestment and cure possible.

This something may perhaps be the so-called "artificial immunity" and is probably brought about the same as in other infectious diseases (and as we can bring it about in the animal experiment) through the formation of specific toxins, which in one case are generated by germs within the body of the patient, during the existence of the disease, and are artificially introduced in the other.

Another of the favoring circumstances is probably that the patient has escaped incidental inflammation in the adjacent tissues, or within the involved tubercular area by which caseation or liquefaction or both of the formed tubercle might have been induced and that the connective tissue changes continued uninterruptedly and became sufficient so as to cause the enclosure and transformation of the tubercles and the death of the germs.

Finally, the patient's mode of life and environment, favorable climatic conditions, and freedom from mental care and worry, good and suitable food, and general influences of various sorts of a favorable character can, and no doubt do, contribute in various degrees.

This I believe to be the usual onset and most frequent termination of the early course of chronic, pulmonary tuberculosis. Owing to the vagueness of the symptoms and the frequent absence of systematic professional observations, the correct diagnosis is but rarely made in this, the "truly early stage," in which many spontaneous recoveries are proved to have taken place, and many more would undoubtedly result, if the patient and physician were cognizant of the true cause of the indisposi-

tion which marks the eruptive period, and complied with the indications in the necessary general care and management of this stage.

In the absence of such prudential measures, the patient continues, or quickly resumes his former mode of life, subjects himself to influences which favor the occurrence of local destructive processes, and of extension if not of new infections, the advent of which mark the beginning of the phthisical stage.

ACUTE PULMONARY PHTHISIS.

Most writers distinguish between certain types of pulmonary phthisis according to their clinical course, or according to the anatomo-pathological changes which predominate in the involved lung. While this is really unnecessary, and at times confusing, I shall nevertheless conform to this established division, as far as practicable; but desire to point out that the different forms of phthisis, all have in common the substratum of tubercle formation and of their liquefaction; and that the varying clinical manifestations observed in the phthisical state depend upon the degree and the rapidity of the changes which occur in the tubercular deposits, and upon incidental inflammations and complications.

The destructive changes may be initiated at an early period or even during the eruptive stage, or they may remain in abeyance for weeks or months or years, and do not necessarily occur at all.

When the destructive processes coincide with, or immediately follow the eruption of tubercles, it seems probable to me that my observations are correct, namely, that in such instances the eruption is very dense, i. e., that the tubercles are closely adjacent to each other over a considerable surface. The resulting reactionary inflammation peripheral to the tubercle becomes then diffused, the round celled inflammatory exudate involves the entire part, and caseates in mass, which, like other caseous pneumonic area, is prone to break down at once. When, on the other hand, acute phthisis develops in the chronic course of the disease, the pneumonic inflammation which characterizes it may be due to new eruption of tubercles in an area which is already the seat of a latent deposit, or of one which is already breaking down; or else, it is due to incidental inflammation, or from internal causes (aspiration pneumonia) or from external infection, through capillary bronchitis, grippe, etc.

The resulting clinical manifestations are usually severe and urgent, and the course is rapid, although (more frequently in the chronic course), the disease may show evidence of amelioration, or even of complete sub-

sidence, coinciding with the outward discharges of the broken down and liquefied dead tuberculous tissue.

This acute course, frequently designated as "galloping" or "quick" consumption, appears preferably in young, previously anaemic, and perhaps otherwise non-resistant subjects, especially when the tubercle formation has been extensive, or long continued, or both, and when by the higher or longer continued fever, the nutritive processes have been greatly damaged and impaired.

As stated before, the initiation of the destructive processes may occur during the eruptive stage or follow it at once, and in such instances no period of latency is observed. Its advent is usually ushered in with high fever, with chill or chilly sensations, while locally the evidence of consolidation increases rapidly and extends, often involving an entire upper lobe or even a larger area. The fever is first continuous, though it shows marked remissions, and often exacerbations, when the local inflammation extends or when pleurisy becomes a complication.

In the beginning the fever is the prominent symptom, although cough and sometimes bloody or rusty expectoration are observed. The cough is due to irritation, or to the bronchial congestion, exudation and catarrh, and haemorrhage may occur.

With increasing absorption of proteins from the liquefying tissues, the temperature assumes the hectic type, and the "typus inversus" may sometimes be observed, severe chills may occur daily, the sweats become profuse, the general condition of the patient deteriorates rapidly, and after a course varying from four to six weeks or two months, he dies of exhaustion, often before the open stage has been reached.

The advent of the latter shows a decided increase in the expectoration which now contains tubercle bacilli and caseous detritus. Unless the exhaustion has become extreme there is a marked amelioration of the symptoms ; and the case may pass into the chronic stage. Often, however, there are several softening centers, and in such the discharge of the first tubercular abscess into a bronchus brings but slight or partial relief.

With the opening of the cavity haemorrhage may occur shortly preceding or coinciding with the perforation of a bronchus, and after a cavity is open, profuse haemorrhages are often observed, which may be followed by pneumonia and death.

Pathological examination after death varies somewhat according to the duration of the illness, and in an earlier period we find a softening caseous area, and more recent tubercles in the adjacent parts; later there may

be additional recent pneumonic centres in the lower lobes or in the opposite lung, but these usually contain no tubercles.

The continued fever, which corresponds to the pneumonic onset, may be the chief symptom and without careful examination, including that of the chest, errors in its interpretation are liable to occur.

Cases of acute phthisis are frequently diagnosed as typhoid fever, especially so in the earlier period and when cough and expectoration are not troublesome.

At a later period when the local lung symptoms are more pronounced, when a cavity has opened, and the discharge is examined microscopically, the lung disease is recognized; otherwise the error is perhaps not discovered unless a post-mortem examination is made, and it reveals the true state of affairs.

In less acute cases, malaria is often thought to be responsible, it being simulated by the daily chill or chilly sensation, fever and sweats, which may be present with but little cough.

CHRONIC TUBERCULAR PHTHISIS.

The clinical difference between the acute and chronic form is one of degree in rapidity of progress and severity of attending symptoms, while anatomically we note more or less fibroid changes in the tubercular area in chronic phthisis, and none at all or but little of such a tendency in the acute form.

Indeed, if the reader will bear in mind the anatomical differences, he can readily understand the difference in the clinical course and symptoms.

In this form, I do not propose to consider that class of cases in which the disease has become latent and cured, either by absorption or by fibroid transformation of the tubercles. Such cases are not objects of professional care and treatment, although the fibroid tissue change may be apparent upon examination of the lung.

In those cases which have not terminated so favorably as to result in a spontaneous cure in the early stage, there is no possibility of drawing distinct and sharply defined lines between the various clinical forms which I shall describe. The acute form of phthisis stands on one extreme and the very chronic fibroid form, with but slight destructive changes, on the other.

Again, the acute form may become chronic and the chronic form may assume an acute character at any time before complete arrestment is obtained, and an intercurrent pneumonia may quickly bring the case to a fatal termination.

As a rule the chronic cases are derived from the class that we have

designated as "latent tuberculosis," that is the tubercular eruption was circumscribed and moderate in degree, after its completion the subjective symptoms disappeared; but an actual cure did not result.

Such a tubercular deposit may have remained latent for many years and in the end have broken down, external or internal influences having favored such an occurrence. It is probable that in such delayed recoveries, there were present larger aggregates of tubercle, which slowly caseated in mass, and became only partially encapsuled.

Such caseous masses may lie dormant as a foreign body, but, unlike a piece of metal or glass, the encapsuled body is of an organic nature, and therefore liable to influences to which a metallic substance once encapsuled would not respond.

However this may be, either without any appreciable exciting cause that we can see and understand or in connection with an attack of bronchial inflammation, the softening of the caseous mass begins.

THE FIBROID FORM OF CHRONIC PHTHISIS.

Cases in which a primary deposit of tubercle in a lung has become latent, and transformed into fibroid tissue, present only the local symptoms of more or less dullness of the percussion note, and upon auscultation we find harsh or bronchial breathing in the involved area. There are no rules unless with or after a recent bronchitis, the catarrhal symptoms of which are apt to persist longer in the fibroid area than elsewhere in the lungs. Such cases often prove very puzzling, when first examined, perhaps in connection with life insurance, or with an attack of acute bronchitis. The entire absence of fever, the previous and present good health, the absence of cough as soon as an incidental acute bronchitis is recovered from, the absence of tubercle bacilli in the catarrhal sputum, if such is temporarily present, and finally the non-occurrence of reaction to a trial dose of tuberculin, should prevent us from falling into the mistake of subjecting such patients or their friends to unnecessary fear or alarm, and of treating them when no occasion exists for either.

The question as to a complete recovery, or of the presence of a simply latent disease which is liable to become active, can, however, only be settled with a tuberculin test, and this should always be employed under such circumstances.

Such patients are well, however, and have no occasion to consult a physician on account of their lungs, and are rarely examined unless, perhaps, for life insurance.

(TO BE CONTINUED.)

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